

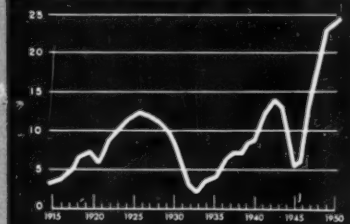
JANUARY 1951

# ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



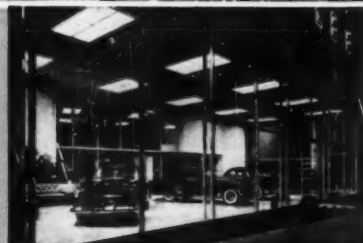
**METAL SPRAY** restores a shaft in Pacific Electric Motor's well equipped shop.




**WHAT'S AHEAD** in electrical construction prospects and mobilization controls for residential, commercial, institutional and industrial work in 1951.



**CONTRACT MAINTENANCE** of lighting systems holds quality and intensity to original design levels.



**SLIMLINES** in semi-recessed ceiling panels light auto showroom. See Modern Lighting department.



Here are two 1260 kvar 2400-volt capacitor banks—major part of this outdoor installation which has dramatically cut power costs in this plant.



## Saves \$40,000 a year

### West Coast chemical plant gets 50% annual return on 3840 kvar of General Electric outdoor capacitors

A \$40,000 annual saving on power costs sounds almost too good to be true—yet that's what a West Coast chemical plant gets. A total of 3840 kvar of G-E capacitors, engineered into the plant's power distribution system, are doing the trick. After taking the installed cost of the capacitors, adding a 15 per cent annual charge for depreciation and maintenance—the return is still about 50 per cent a year on the investment.

**MATCHED TO THE SYSTEM.** Two 1260-kvar banks of Type HLO outdoor capacitors are installed in the high-voltage switchyard through a 3000-kva, 22000/2400-volt step-down transformer bank. Two smaller banks, of 330 and 990 kvar, are part of a 7500-kva double-ended load-center.

**HELPS IN POWER SHORTAGE.** During the recent water shortage

in the west, the power company had to limit the kva delivered to industrial users. This chemical plant's capacitors, keeping the power factor at close to unity, enabled them to squeeze every last available kilowatt out of their kva allotment.

**KEY TO LOWER POWER COSTS.** If you haven't considered capacitors within the last two years, it will pay you to check. The present-day price of capacitors in relation to other equipment has changed the picture of capacitor economics. This West Coast plant is just one of many that are cutting power costs—or relieving overloads—with capacitors. Your local G-E sales office or authorized G-E agent or distributor can help you—or write to Section 407-199 for booklet GEA-5167—"A Way to Cut Power Cost." Apparatus Department, General Electric Company, Schenectady 5, New York.

**GENERAL**  **ELECTRIC**

407-199





# Murray SWITCHES are

Cat. No. PD 238 BS—Series  
(Old Cat. No. 74-8)

Cat. No. PD 338 BS—Parallel  
(Old Cat. No. 77-8)

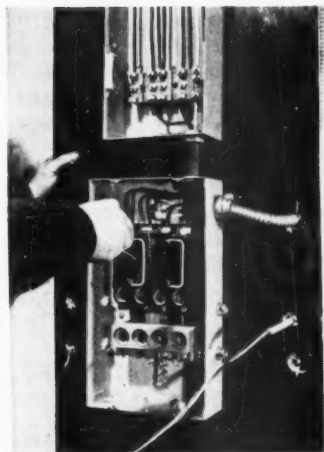
## EASY TO INSTALL

Murray Combination Main Service and Range Switches are specifically designed and engineered for easy installation. The box has plenty of working space. Solderless connectors help the electrician to hook up wires in a matter of seconds. The one screw cover eliminates the nuisance of taking out four screws.

Murray Combination Switches are available with four, six, or eight branch lighting circuits. The eight Circuit Combination, (illustrated) provides for eight branch circuits, plus three-wire separately fused range connections. An extra tap simplifies hot water heater wiring.

# 1

Only one screw to take out to remove the cover. Installation photos taken at John J. Tomasulo, Electrical Contractor, Roselle Park, N. J.

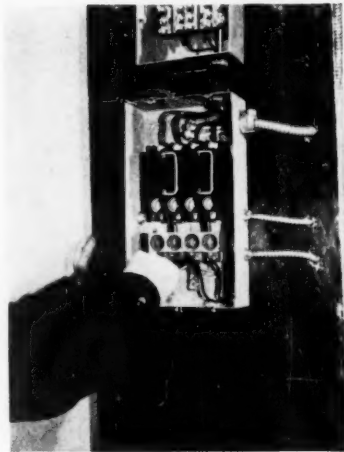


# 2

Plenty of hand room here. Solderless connectors clamp down on wires for positive, permanent contacts.

# 3

Branch circuits and neutral are easy to wire because there is plenty of wiring space and the solderless connectors work smoothly and efficiently.



WRITE FOR CATALOG



IF YOU WANT TO INSTALL THE BEST... specify *Murray*

**MURRAY MANUFACTURING CORPORATION**  
1250 ATLANTIC AVENUE • BROOKLYN 16, NEW YORK

Service Entrance & Meter Equipment • Magnetic Circuit Breakers • Switches  
Current Limiting Reactors • Crows'nest Aerial Ladders

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JANUARY, 1951



# 'round-the-clock PROTECTION APPLETON EXPLOSION-PROOF EQUIPMENT

Photo—Oil & Gas Ind.



New Vented Type EVX Explosion-Proof Lighting Fixture. Available for 60, 100, 150, 200, 300 and 500 Watt Lamps.

Pat. No. 2,530,135

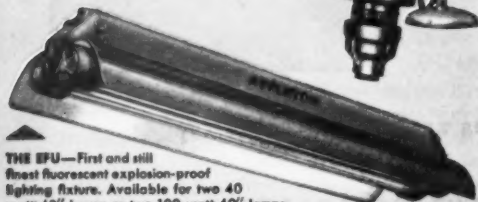


The Appleton Seal-Line Switch Unilet is a combination switch housing and sealing unit. Completely explosion-proof without additional sealing fittings.

Pat. No. 2,208,558



Type FSQX Explosion-Proof and Dust-Tight plug and Receptacle with interlocking safety switch.



THE EPU—First and still finest fluorescent explosion-proof lighting fixture. Available for two 40 watt 48" lamps or two 100 watt 60" lamps.

Pat. No. 2,393,202

Here are conduit fittings and lighting fixtures designed to provide day-and-night protection against the arcs that touch off disastrous fires and explosions in chemical plants, oil refineries, hospital surgeries—wherever explosive or flammable vapors, dusts or gases are present.

Engineered to completely confine the dangerous sparks that lurk in wiring systems, Appleton Explosion-Proof equipment is easy to install and service. And among the hundreds of fittings and fixtures in the complete Appleton Line is an explosion-proof fitting exactly suited to your needs.

Any wiring or lighting job—explosion-proof or otherwise—is a better job when Appleton fittings and fixtures are used. For the better electrical equipment that means better building, specify Appleton, supplier to American builders for nearly half a century.

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# ELECTRICAL CONSTRUCTION AND MAINTENANCE

With whom is associated Electrical Construction, The  
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Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

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ELECTRICAL CONSTRUCTION and  
MAINTENANCE

JANUARY, 1951 • Vol. 50, No. 1

Published monthly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. Publication Office, 69-122 North Broadway, Albany 1, N. Y.

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President; Publications Division: Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to Electrical Construction and Maintenance—Subscription Service, 330 W. 42nd St., New York 18, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders.  
Single copies\* \$52. Subscription rates—United States and possessions, \$3.00 a year; \$4.00 for two years; \$5.00 for three years. Canada, \$5.00 a year; \$8.00 for two years; \$10.00 for three years. Pan American countries, \$6.00 for one year; \$10.00 for two years; \$12.00 for three years. All other countries, \$15.00 a year; \$20.00 for three years. Entered as second class matter August 29, 1935, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U.S.A. Copyright 1951 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.

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requirements!

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## ACCURATE Plastic Tape



Offers a bulk-reducing combination of thin caliper, good mechanical and dielectric strength. Recommended for use wherever plastic tape is practical.

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**... for every  
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# To Cut Costs on 115 or 230 volt circuits

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The right voltage at the right place will cut wiring costs and line losses. Original cost of the transformers can soon be made up in savings. General Electric's M and Ds are completely dependable, easy to install—all standard ratings available for quick delivery. See your electrical distributor or get in touch with your G-E Apparatus Sales Office

Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

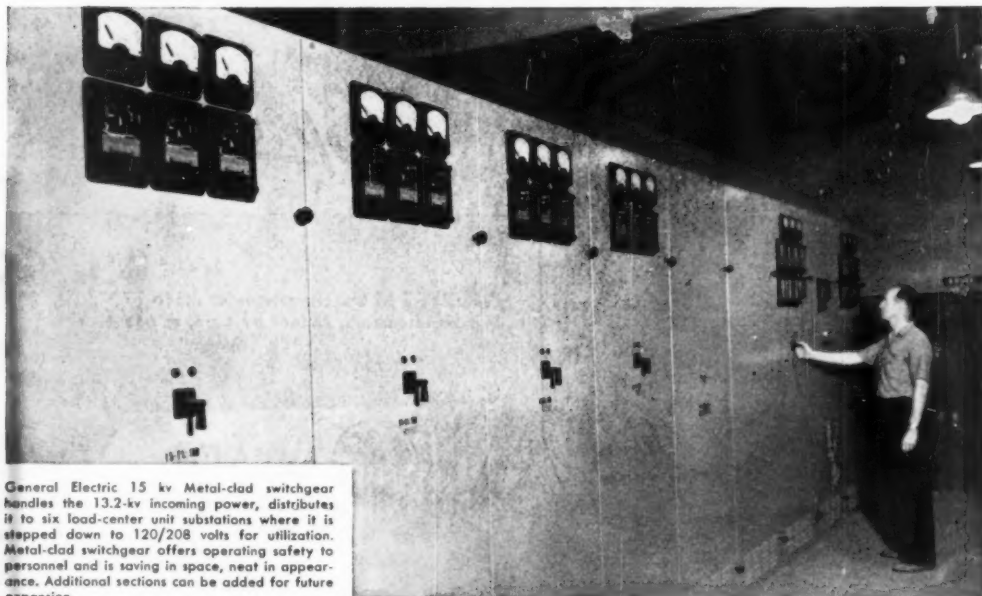
*You can put your confidence in—*

**GENERAL  ELECTRIC**

411-69



# METAL CLAD SWITCHGEAR



General Electric 15 kv Metal-clad switchgear handles the 13.2-kv incoming power, distributes it to six load-center unit substations where it is stepped down to 120/208 volts for utilization. Metal-clad switchgear offers operating safety to personnel and is saving in space, neat in appearance. Additional sections can be added for future expansion.

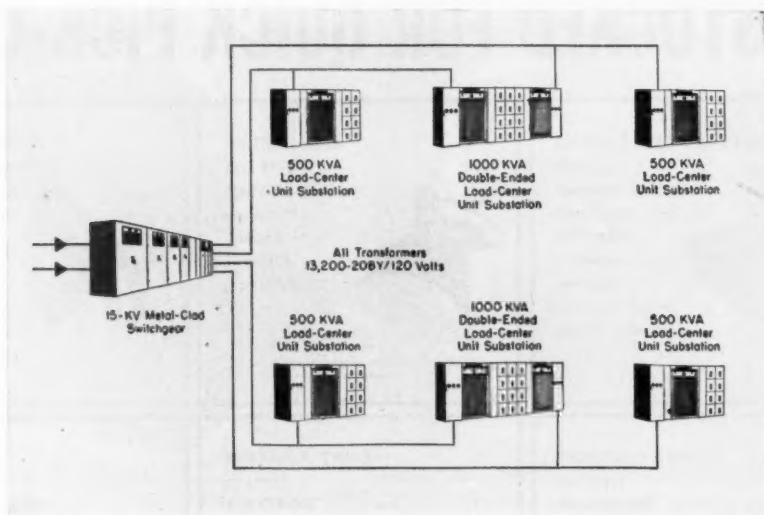


Load-center unit substations receive 13.2 kv power and step it down to 120/208 volts for utilization. Air switches on primary are easy to operate, blades are easy to see. Note entire load-center is metal-enclosed thus offering operating safety to personnel.



Low-voltage end of load-center unit substation showing air circuit breakers that have plenty of "IC" (Interrupting Capacity) to handle all short circuits. Breakers are of the drawout type, easily removable for inspection or maintenance.

# HELPS PROTECT SERVICE AT TELEPHONE COMPANY INSTALLATION



In this installation General Electric Metal-clad switchgear receives the incoming 13.2 kv power and distributes it to six G-E load-center unit substations. Three load-centers, two single-ended units rated 500 kva and one double-ended rated 1000 kva, are located in the basement. Three other units of identical rating are on an upper floor. From these load-centers utilization circuits feed 208/120-volt power both upwards and down, and provide efficient, low-cost power at constant voltage wherever desired.

This installation is a complete General Electric project—one source of responsibility plus the very best in coordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

MODERN INDUSTRIAL power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want proper voltage for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs.

INVESTIGATE TODAY the many advantages of using General Electric switchgear in *your* plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—or write for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

- GEA-3083 Metal-clad Switchgear
- GEA-4966 Low-voltage Metal-enclosed Switchgear
- GEA-3592 Load-center Unit Substations
- GEA-3758 Load-center Power Distribution

## GENERAL ELECTRIC



# FLOODLIGHTS

for 95% of your jobs

## STOCKED FOR QUICK PICK-UP

### SPORTS AND AREA LIGHTING

Type L-69

1000-1500 watt

Alzak\* processed  
aluminum  
spun-sealed—  
enclosed  
Wide, medium  
or narrow beam



### AREA LIGHTING

TYPE L-45

300-1500 watt

Porcelain  
enamel  
Open—  
Wide beam



*Alzak\* aluminum adaptor available for  
concentrated beam*

### GENERAL PURPOSE

Type L-82 500 watt

Type L-83 1000 watt

Alzak\* processed  
aluminum  
Hinged door—  
enclosed  
Narrow or  
wide beam



### HANDY FLOODLIGHT

Type L-66

200-300 watt

Wide beam—  
aluminum  
Clamp-ring  
door—  
enclosed



### HANDY FLOODLIGHT

Type L-65

100-150 watt

Wide beam—  
aluminum  
Snap-ring  
door—  
enclosed



### LAMP HOLDER

Type L-65-P

Takes 150 watt Par 38

spot or  
projector  
floodlight  
(not furnished)



For 95 per cent of your needs these General Electric floodlights will do the job—and they are immediately available from your G-E distributor's shelves.

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All General Electric floodlights are designed for quick installation and easy maintenance. With G-E floodlights installed, you can accept maintenance contracts with confidence.

See your General Electric distributor for the floodlight that's right for your job.

*\*Manufactured under Aluminum Company of America Patents.*



**YOURS FOR THE ASKING**—This manual contains floodlighting plans for all popular outdoor sports. It's complete—right down to lists of materials. You'll find it a handy reference. Just ask for GET-1284C, Apparatus Department, General Electric Co., Schenectady 5, New York.

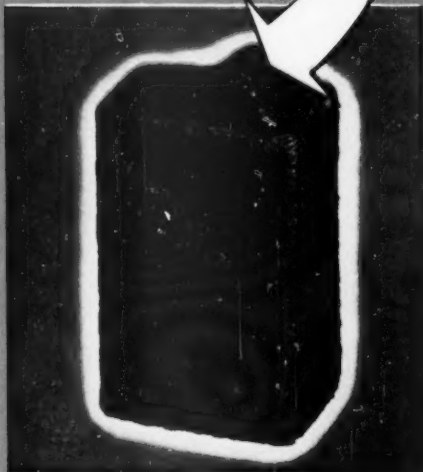
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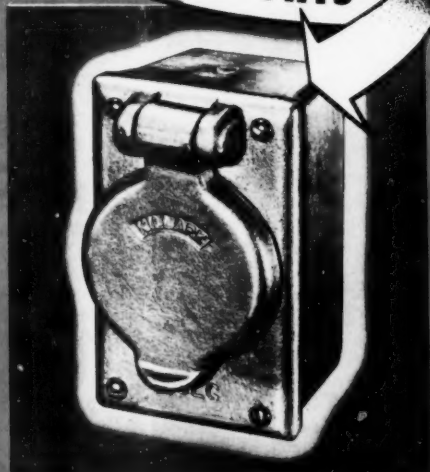
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\*Pat. Pending



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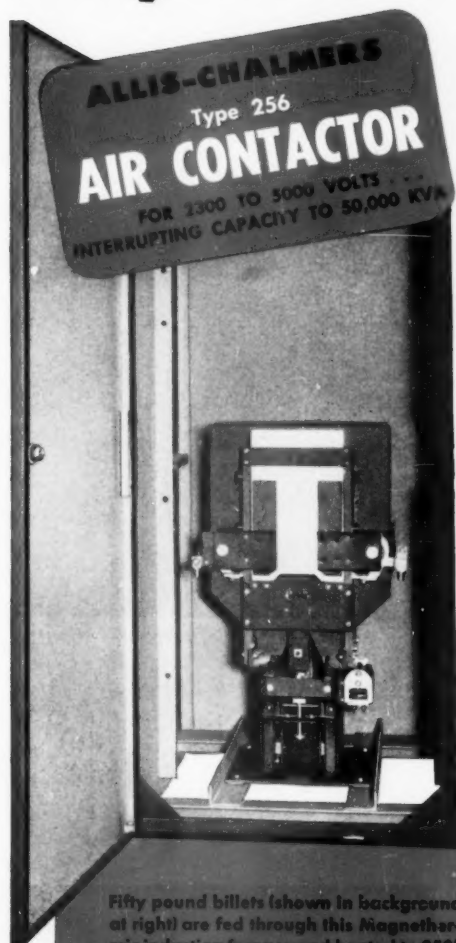
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**ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois**

**"A BOX FOR EVERY NEED"**

# 30,000 Operations *EVERY* Month



Fifty pound billets (shown in background at right) are fed through this Magnethermic induction furnace and heated to 850° at the rate of one per minute. The contactor must open as each billet is unloaded from the furnace and fed into the extrusion press at left . . . adds up to about 30,000 operations at full load each month.

A-1329

"THIS TYPE 256 CONTACTOR operates under full load approximately 30,000 times per month. We have yet to find another contactor that will stand up under this service!" says J. A. Logan, president of Magnethermic Corporation, manufacturers of low frequency induction heating equipment.

"This contactor is now standard equipment on all of our 2300 and 4000 volt furnaces. All other high voltage contactors that we originally installed on our furnaces have been replaced by the Allis-Chalmers Type 256 Air Contactor."

Opening and closing the primary of an induction furnace at full load once every minute may be different than your control problem. But think of the years of trouble-free service a contactor capable of this duty will give you on normal motor starting applications!

What makes performance like this possible? Double break contacts and straight line vertical action are combined in Type 256 Air Contactors to eliminate maintenance factors such as flexible contact leads, turning shafts and shaft bearings.

Magnethermic Corporation's experience is typical . . . indicates the service you too can expect from Type 256 Air Contactors. These contactors are clean, easy to inspect, accessible, and compact. Call your Allis-Chalmers representative, or write for bulletin 14B7303. Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin.



## ALLIS-CHALMERS



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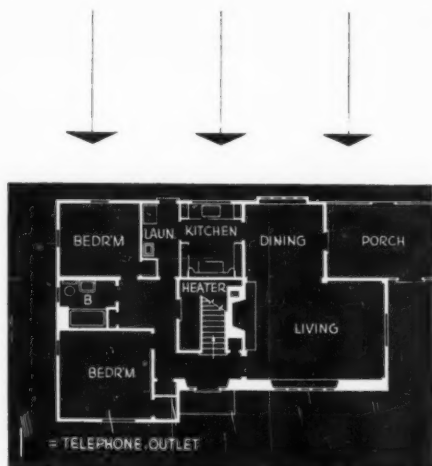
George R. PAUL, Architect

## Plan a "disappearing act" for telephone wires

Hidden telephone wiring is a sign of thoughtful construction—and a source of extra profit for the electrical contractor.

Telephone raceways can be built in easily and inexpensively. During construction, place a few lengths of rigid or flexible conduit inside the walls and connect them to conveniently placed telephone outlets. These will provide "hidden passages" for wires when telephones are installed later on.

**Remember—NO ELECTRICAL CONTRACT IS REALLY COMPLETE UNLESS IT CONTAINS RACEWAYS FOR TELEPHONE WIRES.**



**BELL TELEPHONE SYSTEM**





In Electric Exhaust Ventilators THIS ISN'T ALL

# ...The Blade's the thing!

## Blo-Fan\*

HAS THIS BLADE EXCLUSIVELY!



### Efficiency

The patented Blo-Fan blade combines the volume of a breeze fan with the power of a blower to move air quickly, quietly and efficiently. No other electric exhaust ventilator has this blade!



### Adjustability

Only Blo-Fan Model 210 has this NINE-position control switch that makes it as easy to control the rate of ventilation as it is to regulate the thermostat on a kitchen range.



### Adaptability

Blo-Fan installs over the point of air pollution—in the ceiling or any wall (inside or outside). Requires only 3½ inches behind plaster; uses standard 3¼" x 10" furnace duct.



### Simplicity

Blo-Fan is easier to clean—no tools are ever required—NOT EVEN A SCREW DRIVER. All you do is unscrew the large center cap and remove the grille and motor assembly.



### Experience

For over 25 years Pryne and Company has made home owners happy by manufacturing superior electric ventilators especially designed for home use in the kitchen, bath, game room and laundry.

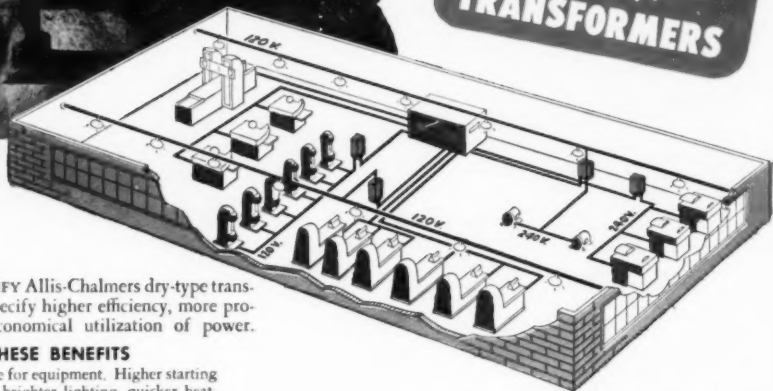
**Blo-Fan** AMERICA'S MOST IMITATED HOME VENTILATOR  
Stocked by more than 650 wholesalers in over 350 cities  
Manufacturers of Pry-Lites... the original recessed lighting fixture with snap-on fronts  
**PRYNE & CO., INC.** BOX E-1, POMONA, CALIF.  
Warehouses: Los Angeles, San Francisco, Chicago, Atlanta  
Eastern Factory: Newark, New Jersey

Trade Mark Reg.

# Side Step POWER LOSSES



**ALLIS-CHALMERS**  
*Dry-Type*  
**TRANSFORMERS**



**W**HEN YOU SPECIFY Allis-Chalmers dry-type transformers you specify higher efficiency, more production and safe, economical utilization of power.

#### GET THESE BENEFITS

1. Top performance for equipment. Higher starting torque for motors, brighter lighting, quicker heating. You eliminate waste power by installing dry-type transformers near or on the machine it serves.
2. Flexibility in matching changing loads. Shift the dry-type transformer when new machinery is added or when distribution lines are unbalanced and subject to overloads.

#### IMMEDIATELY AVAILABLE

Quick delivery from dealers coast to coast. No need for costly fire proof vaults. The dry-type transformer meets safety requirements for indoor applications.

Men who work with plant layout have discovered how Allis-Chalmers dry-type transformers overcome heavy secondary losses and poor voltage regulation.

#### QUICK TO INSTALL, LONG ON SERVICE

**SOLDERLESS CLAMP CONNECTORS** reduce hook-up time to minutes. Just clamp leads to solderless

connectors. Standard on units 15 thru 50 kva (single phase) and 37½ thru 100 kva (three phase). On larger sizes flat drilled bars are suitable for any connector. 10 kva and smaller (single phase) and 25 kva and smaller (three phase) front and bottom plates drop out.

**HEAT RESISTING "FIBERGLAS"** insulation cuts down transformer size and weight and gives added protection against fire hazard. All welded case and sturdy side frames retain alignment of the core and coils. *Spra-Bonderized* and given 3 coats of baked-on durable paint.

For more information see your local Allis-Chalmers sales office. Or write direct for bulletin 61B6382A.

**ALLIS-CHALMERS, 930A SO. 70 ST.  
MILWAUKEE, WIS.**

A-3200

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*IT'S NEW!  
IT'S IMPROVED!  
IT'S DUAL-PURPOSE!*



Listed by Underwriters'  
Laboratories as

**TYPE RH-75°C**  
or  
**TYPE RW-60°C**

## **PARANITE HYDRO-THERM BUILDING WIRE**

Paranite Hydro-Therm combines in a single wire the heat-resistant qualities of Type RH and the moisture-resistant qualities of Type RW.

**USED IN DRY LOCATIONS** Paranite Hydro-Therm carries more current per dollar of cost. The higher amperage rating for Type RH wire under the National Elec-

trical Code provides greater current carrying capacity. You can use smaller conductors, smaller sizes of conduit; and lower your labor costs.

**USED IN WET LOCATIONS** Paranite Hydro-Therm is rated as Type RW wire for 60°C operation because of its excellent moisture-resistant qualities.

IF IT'S **PARANITE** IT'S RIGHT!

DISTRIBUTED  
THROUGH  
WHOLESALE

**PARANITE WIRE AND CABLE**  
Division of ESSEX WIRE CORPORATION  
FORT WAYNE 6, INDIANA



WAREHOUSES\* AND SALES OFFICES: \*Adams, Ok.; Austin, Texas; \*Chicago, Ill.; Cleveland, Ohio; Dallas, Texas; \*Detroit, Mich.; \*Houston, Tex.; \*Los Angeles, Calif.; \*New York, N.Y.; \*Philadelphia, Pa.; \*Portland, Ore.; \*St. Louis, Mo.; \*San Diego, Calif.; \*San Francisco, Calif.

EXPORT SALES OFFICE—LIONEL-ESSEX INTERNATIONAL CORPORATION, 15 E. 26th ST., NEW YORK 10, N.Y.

**ELECTRICAL WIRES AND CABLES "BETTER THAN CODE REQUIRES"**

# You can't buy Better Fittings

or ones that  
cost less  
to use



Cross Section  
Showing  
Indentations.

Quicker to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable to the contractor and satisfactory to his customers.

Two Easy Squeezes and they're set to stay. It is only natural that the Briegel All-Steel Indenter Fittings are the most widely used E.M.T. connectors and couplings. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job neater, stronger and better.



All B-M Fittings Carry the  
Underwriters Seal of Approval

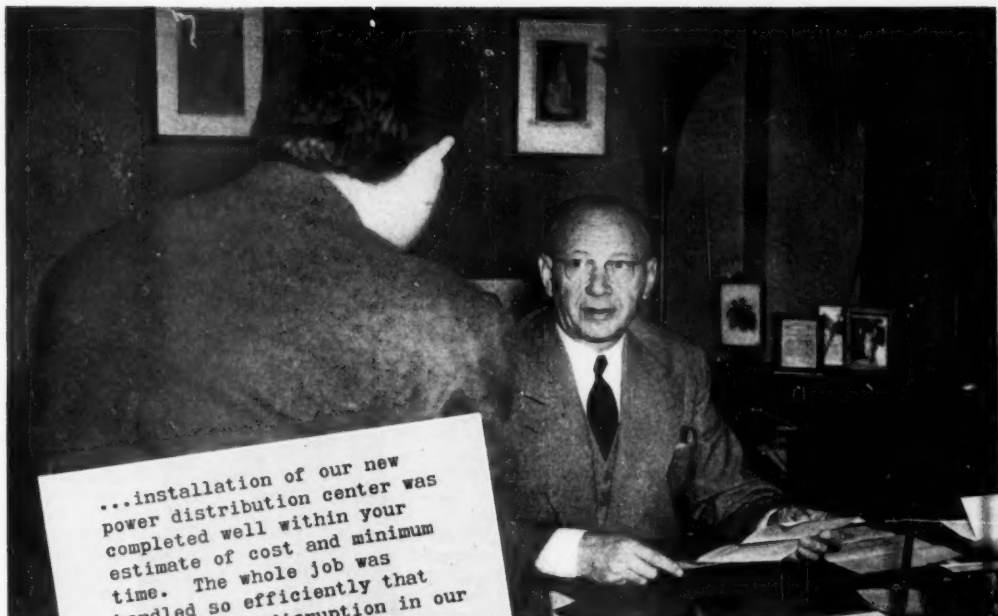


**BRIEGEL** METHOD  
TOOL  
CO.  
GALVA, ILLINOIS

#### DISTRIBUTED BY

The M. B. Austin Co., Northbrook, Ill.; Clayton Mark & Co., Evanston, Ill.; Clifton Conduit Co., Jersey City, N. J.; General Electric Co., Bridgeport, Conn.; The Steelduct Co., Youngstown, Ohio; Enameled Metals, Pittsburgh, Penn.; Kondu Mfg. Co., Ltd., Preston, Ont.; Wagner Malleable Products Co., Decatur, Ill.





...installation of our new power distribution center was completed well within your estimate of cost and minimum time. The whole job was handled so efficiently that there was no disruption in our normal operation...

—from a letter to Henry F. Fischbach of Fischbach and Moore, Inc., Electrical Contractors

*"That's the kind of a letter I like to get!"*

Of course . . . Fischbach and Moore chose Qiklugs for this job—one of the quick-action, high-strength Burndy connectors that prove, again and again, *good connections make good customers!* There's a Burndy connector that's better-built for *every* job. Ask your Burndy distributor.

## BURNDY QIKLUG

**rugged • compact • versatile • need no special tool**

Small, neat, easy-to-work-with. Speedy installation—tighten the single nut with the ordinary wrench you always have on hand!  
Cool—cast of high-conductivity alloys. All contact surfaces grind-finished. All parts corrosion-resistant.  
Each unit takes convenient range of conductor sizes.



**quick**

# BURNDY

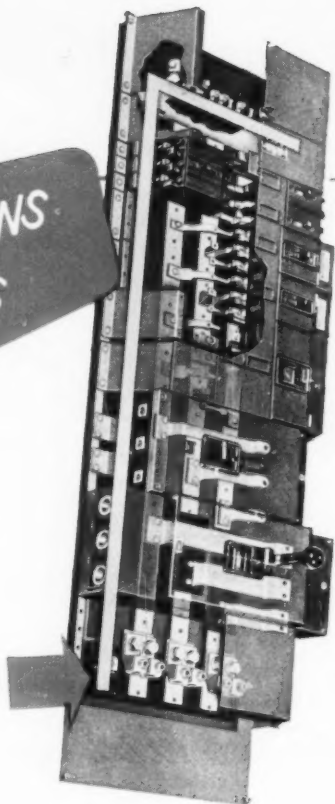
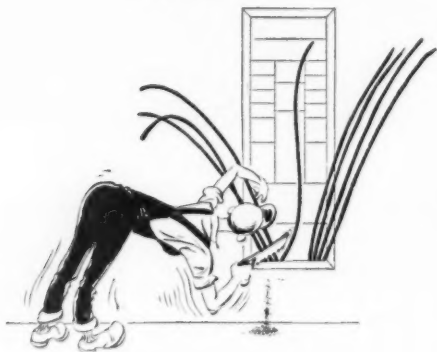


1-1 Burndy Engineering Co., Inc., New York 54, N. Y. • Western Branch: Vernon 58, Calif. • Burndy Canada Ltd., Toronto 8, Ontario

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JANUARY, 1951

YOU CAN BE **SURE**.. IF IT'S  
**Westinghouse**

**FAST INSTALLATIONS  
CUT JOB COSTS**



## **Eliminate Cable Waste**

### **... with NEUTRAL BAR EXTENSIONS**

You're cutting your profits when you pull extra footage of main feeders to reach the neutral bar . . . footage that usually ends up as scrap when final connections are made.

Eliminate this cable waste by using Westinghouse Nofuze Convertible Distribution Panelboards. A built-in neutral bar extension makes it possible to locate all feeder terminal connections (including neutral) at the same end of the panel.

This is but one example of many cost-saving features found in Westinghouse panelboards. Combined with timesaving features and top-quality construction, Westinghouse gives you

a superior panelboard that costs less . . . when *all* the bills are in. Next time, be *sure* about savings. Specify Westinghouse!

Descriptive bulletin 30-930 contains complete information. Call your nearest Westinghouse office or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.  
J-93455-A

**Westinghouse**  
**PANELBOARDS**



# why there can be NO OTHER ANSWER IN SAFETY SWITCH SELECTION

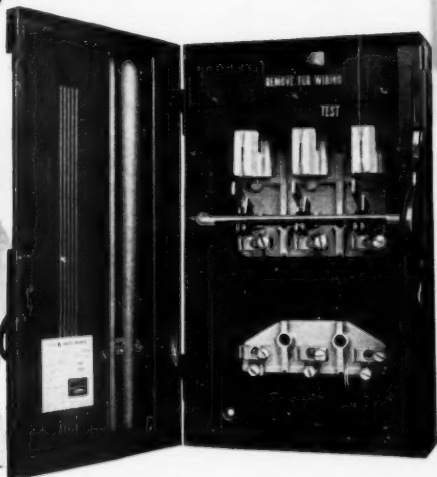
Engineering research authenticated by outstanding authorities has conclusively established "internal heating" to be the principal cause of safety switch failures. This "internal heating" literally bakes the life right out of safety switch parts, causing insulating materials to disintegrate and metal parts to distort and corrode. The safety switch then either becomes inoperative or it "burns up" through inability to carry the load.

In properly constructed safety switches, fuses are almost entirely responsible for this destructive "internal heating." This is not a criticism of fuses for any fuse operating up to its rated load *must* be near its melting point if it is to perform properly when an overload

occurs. And any metal operating *near* its melting point *must* be hot . . . and fuse links are *hot* . . . with temperatures running as high as 700 degrees Fahrenheit.

Since you cannot vent trapped heated air through a safety switch enclosure and still keep a safety switch *safe*, the only escape from the ravages of "internal heating" *must* come through the selection of materials for the internal safety switch structure and the design of that structure to *withstand successfully the unavoidable heat conditions met in safety switch service.*

Cutler-Hammer Safety Switches were completely redesigned in this way *ten years ago* to beat "internal heating" when engineering research clearly indicated the need for *such* safety switches. Nine years of experience shows the Cutler-Hammer claim of better safety switch performance far more than a mere promise; it is a *proven fact* that demonstrates why there can be no other answer in safety switch selection. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin.





for FUSE ECONOMY... use ECONOMY FUSES

...and CONSERVE *precious Brass and Copper*

"ECONOMY DE-LAY" Renewable Fuses offer you the opportunity to conserve scarce Brass and Copper and at the same time make a real saving in the cost of your Fuse maintenance.

After your first cost of an "ECONOMY DE-LAY" Renewable Fuse, you pay only a few pennies for an "ECONOMY DE-LAY" Renewal Link to restore the Fuse to its original efficiency after a "blow". This is much cheaper in the long run than any other type of Fuse protection you can buy.

The simplicity and unusually fine mechanical construction of "ECONOMY DE-LAY" Renewable Fuses and Renewal Links make replacement quick, easy and inexpensive.

With a reputation for Pioneering and Constant Improvement, ECONOMY has always made its Renewable Fuses and Renewal Fuse Links to meet the maximum of all requirements of "The Standard for Fuses".

Millions of ECONOMY Renewable Fuses have been in service for years, giving low-cost protection to electrical installations. Keep a full stock of "ECONOMY DE-LAY" Renewable Fuses and Renewal Links on hand!

Ask for the ECONOMY Catalog and Price List.

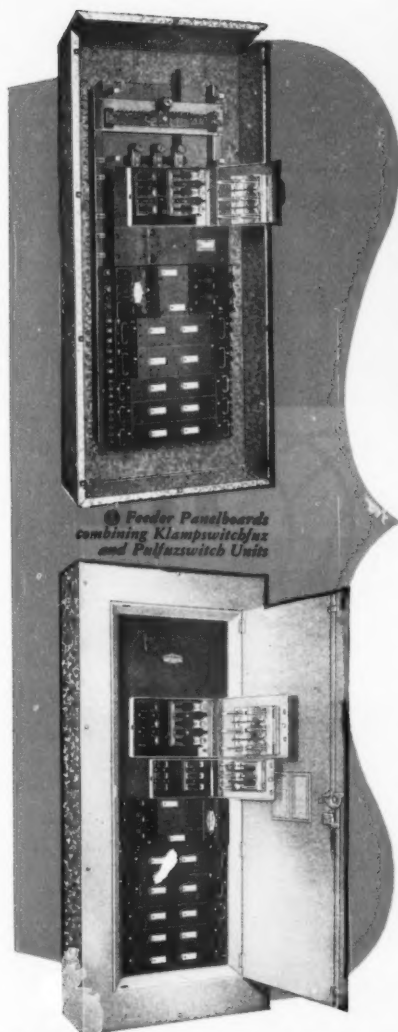
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**ECONOMY  
DE-LAY** RENEWABLE CARTRIDGE FUSES

Your Electrical Wholesaler has "ECONOMY DE-LAY" Renewable Fuses and Renewal Links in stock.

**ECONOMY FUSE AND MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILLINOIS**

REPRESENTATIVES IN  
ALL PRINCIPAL CITIES



Ⓐ PULFUZSWITCH capacities: 30, 60 and 100 amps, 250 volts AC or DC, 30; and 60 amps, 600 volts AC in 2, 3 and 4 pole.

Ⓐ KLAMPSWITCHFUZ capacities: 30 to 600 amps, 250 volts AC or DC; and 30 to 200 amps, 600 volts, AC in 2, 3 and 4 pole types, single or double throw.

Ⓐ SHUTLBRAK capacities: 30 to 600 amps, 250 volts AC or DC; and 600 volts AC in 2, 3 and 4 pole types.

For  
**Efficiency, Safety**  
 and  
**FASTER DELIVERY**  
 It's  
**STANDARDIZED** Ⓐ **FUSE-TYPE**  
**FEEDER PANELBOARDS**

In times like these, when plant facilities must be expanded or modernized, Standardized Ⓐ FUSE TYPE FEEDER PANELBOARDS, are particularly ideal.

Recently re-designed, inside and out, to minimum space requirements . . . without sacrificing such popular features as generous wiring space and ease of installation . . . these improved, compact feeder panelboards are built of standardized units and assembled, as required for specific application, thus *facilitating deliveries*.

Four standardized widths, ten standardized heights and three standardized depths of boxes meet any requirement. Boxes are shipped from stock . . . with removable ends to permit drilling of conduit openings on the job. Too, panels are readily installed after boxes are in position.

Two dependable Ⓐ Switches . . . the Ⓐ PULFUZSWITCH and the Ⓐ KLAMPSWITCHFUZ . . . make these feeder distribution panelboards the finest in safety and efficiency. Both types combine switch and fuse in one unit so that current is OFF when the door is opened, or the fuse carrier removed. This makes replacement of fuses safe . . . quick . . . simple.

For operating switch requirements, Ⓐ Shutbrak Type A, Quick Make and Quick Break Interlocking Switches are available in the same standardized construction.

*For more information about the standardized Ⓐ Fuse-type Feeder Panelboards, talk it over with your Ⓐ representative (he's listed in Sweet's).*



**Frank Adam Electric Co.**

Our 60th Year... ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHEATER



ease of installation  
+ permanence

## 2 good reasons

why you should plan for rubber-  
covered building wire made with

# FIBERGLAS

## FIBERGLAS\*

*Won't rot*

*Won't burn*

*Won't absorb moisture*

*Have great tensile strength*

*Permit production of wire with thinner textile*

*covering that pulls through conduits easily*

Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

OWENS-CORNING

# FIBERGLAS

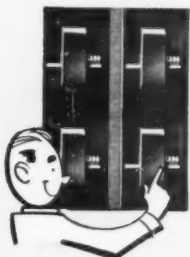
OWENS-CORNING FIBERGLAS CORP., Electrical Sales Division  
16 East 56th Street, New York 22, N. Y.

FIBERGLAS IS IN YOUR LIFE . . . FOR GOOD!

# "Here's why I'm changing to *Pushmatic* Electri-Centers for every panelboard job"

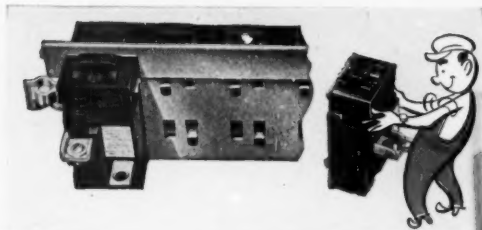


**"Fastest delivery!** We used to lose out on rush panel-board jobs. Couldn't get equipment in time. But never again! Our local Distributor sold us on stocking a small, working supply of basic Electri-Centers and flexible, interchangeable Pushmatics. That way, we can give prompt delivery and installation. And our customers really appreciate fast service!



**Push—it's ON!**  
**Push—it's OFF!**  
**Push—it's ON again!**

**"Simplest switching!** Nothing to it! A push of the finger switches the current either ON or OFF. If Pushmatic is automatically tripped by short or overload, just push and service is restored. No bothersome resetting by hand . . . no fuses to buy. Only Pushmatic offers simple push-button switching.



**"Most flexibility!** Pushmatics are identical in size and contour, regardless of rating or type. That means each unit can be quickly inserted, removed or interchanged without disturbing other units. And Pushmatics are available in THERMAL-MAGNETIC or THERMAL-MAGNETIC with exclusive AMBIENT COMPENSATING FEATURES to meet every load condition! They're rated at 15, 20, 30, 40 and 50 amperes, 1 pole, 120 V., or 2 poles, 120-240 V., AC.



**"Surest protection!** Approved by Underwriters' Laboratories, quick-break Pushmatics operate with split-second precision when overload or short occurs. Automatic tripping is entirely independent of manual operation. And for installations subject to unusual temperature variables, new Ambient Compensated Pushmatics carry 100% of their normal rating at any ambient temperature between 30°F. and 150°F."

**BULLDOG ELECTRIC PRODUCTS COMPANY**  
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES  
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

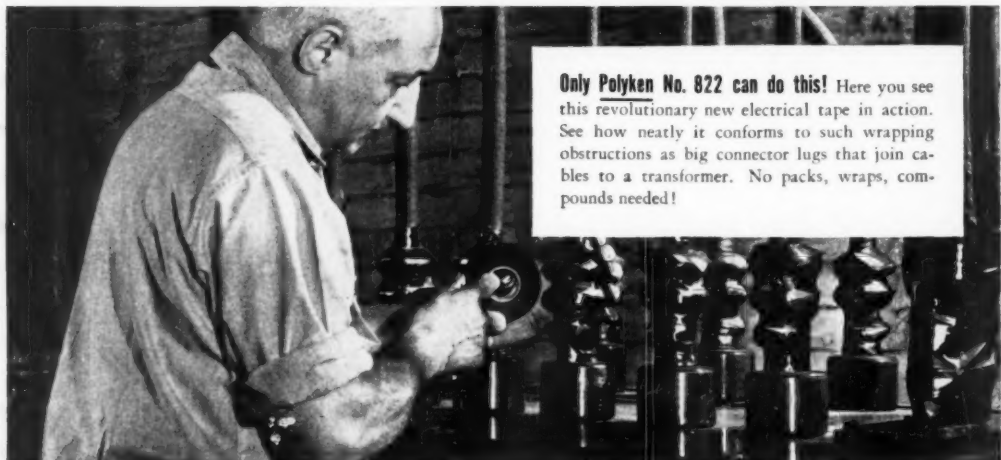


## BULL DOG

**PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS**

# THE NEW Polyken® INDUSTRIAL TAPES

TAILORED TO YOUR JOB



**Only Polyken No. 822 can do this!** Here you see this revolutionary new electrical tape in action. See how neatly it conforms to such wrapping obstructions as big connector lugs that join cables to a transformer. No packs, wraps, compounds needed!

## Now wrap high-tension cables in ONE easy step!

Until *Polyken* No. 822 was developed, wrapping high-tension cables was a two-step job. First, a rubber splicing compound, followed by an outer wrap of friction tape.

Now you can forget about the rubber compound! *Polyken* Electrical Tape No. 822 is only 9 mils thick—but it's 10,000 volts strong (dielectric strength). Makes one

quick operation out of two tedious ones with no sacrifice of efficiency.

No. 822 is the only oriented polyethylene tape with a successful pressure-sensitive adhesive. Stretches both ways, so that it covers rough and irregular surfaces. High moisture resistance. Solvent proof. Corrosion proof. For splicing, wrapping, insulating, corrosion coating of cables, wires, controls, pipes, conduits, and hundreds of other uses. Write for free samples today!



**GET FREE SAMPLES** of *Polyken* No. 822, plus complete specifications and engineering data. Write *Polyken*, Dept. ECA, 222 West Adams Street, Chicago 6, Illinois.

*Polyken* Industrial Tape, Department of Bauer & Black, Division of The Kendall Company

YOU CAN BE **SURE**.. IF IT'S  
**Westinghouse**



## **One Set of Connections** ***THAT'S ALL!***

No need to install separate switches and protective devices with Westinghouse Dry-Type Transformers, Types AJRB and AVR B. They have circuit breakers built in!

It's a better installation, too. The integral breaker gives three-way protection . . . something no combination of transformer and external protectors can do. Because the breaker is located inside the transformer case, it is actuated by (1) overcurrent, (2) temperature, or (3) by both in combination. Greater safety

for equipment on the line! Better protection for the installation!

Available in ratings from 100 to 15 kva (Type AVR B) and 10 to 3 kva (Type AJRB). Other dry-type transformers without breakers are available.

Ask your Westinghouse representative for further information, or write for Booklets B-4009 and B-4439. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70577



**Westinghouse**  
**DRY-TYPE**  
**TRANSFORMERS**

# Interested in \$500 trifles?



ONE MINUTE LOST is a mere trifle. But lose one minute out of ten while installing fittings — take 10% too long for the job — and you lose \$500 worth of trifles per man per year...Gedney Fittings *stop* such losses, for Gedney's are machined with absolute accuracy and slash your installation time. Order them now.

## GEDNEY FITTINGS FIT!



- ★ Accurate malleable iron castings...stop breakage
- ★ Threads are machined to closest tolerances.
- ★ Reinforcing ribs for extra strength...extra grip.
- ★ Smoothed shoulder protects the wire.

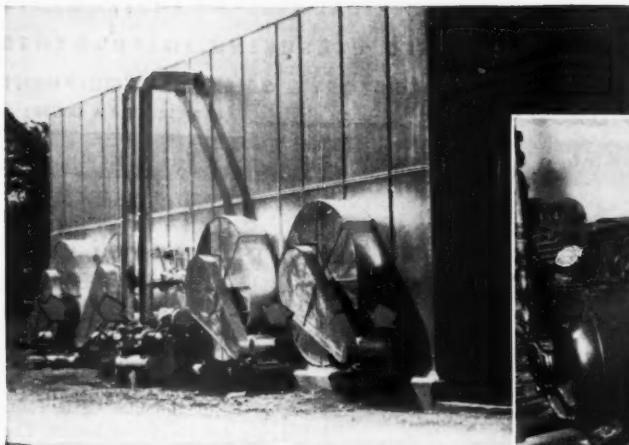


**GEDNEY**  
ELECTRIC COMPANY

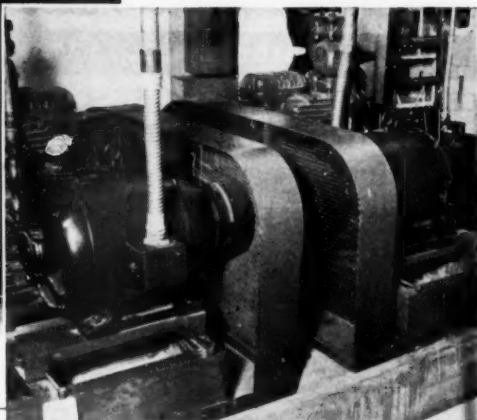


RKO BLDG. • RADIO CITY • NEW YORK 20  
Foundry, Factory and Shipping Point: Terryville, Conn.





Four Century 5 horsepower splash proof motors driving fans.



Two Century 30 horsepower motors driving refrigeration compressors.

*Century*

**TYPE SC-  
SQUIRREL CAGE MOTORS**



1/8 to 3/4 horsepower



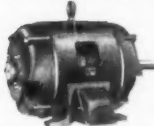
1 to 1 1/2 horsepower



2 to 15 horsepower



20 to 125 horsepower



150 to 400 horsepower

## Equipment Producers

## Select *Century* Motors

## To Give You Long-Life Performance With Least Down-Time

The correct selection of the right combination of motor type, speed, power, torque, frame and mounting keeps Century motors on the job.

Team work between your motorized equipment producers and Century motor engineers means that you always get the right motor—selected from Century's wide range of types and kinds, in sizes from 1/8 to 400 horsepower for single or polyphase alternating current and direct current. You can be confident that you get top performance from the fine equipment these motors drive.

Skillful application makes sure that Century motors meet the exacting requirements of the machines they drive. That's your assurance of dependability.

**CENTURY ELECTRIC CO.** 1806 Pine St., St. Louis 3, Mo.  
Offices and Stock Points in Principal Cities

Specify  for all your electric power requirements

CE-550R

**BIDDLE***Instrument News*

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

NUMBER 5 OF A SERIES

**JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.**

## **CERTAINTY IN CIRCUIT TESTING WITH DIRECT INDICATING, TRUE OHMMETER**



### **Midget Megger® Makes Many Friends**

From a chief electrician of a New England fishery . . . from the Mechanical Department of a railroad . . . from users in many different industries . . . we receive letters of enthusiasm for the Midget "Megger" Circuit Testing Ohmmeter. Reports show these instru-

ments last several decades and one user claims, "It has paid for itself 25 times or more."

This little instrument is not merely a voltmeter calibrated in ohms; it's a true ohmmeter, using any make of flat type, 3-cell flashlight battery, but operating independently of the exact battery voltage.

Push-button spring terminals for quick connections. Your choice of push-button battery switch on instrument or testing spike. Ohm scales available for ranges from .1 ohm to 200,000 ohms. Each scale has two ranges.

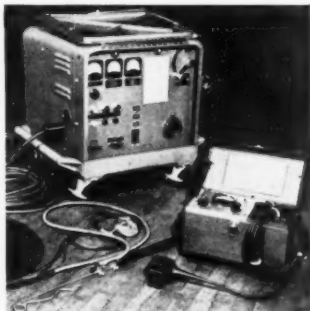
### **An "A-1" Trouble Shooter**

For testing coils, resistors, contacts, windings, circuits, relays, etc., and even insulation resistance up to 50 and 200,000 ohms.

New Bulletin mailed on request. Please ask for 1495-ECM.

## **BIDDLE IMPULSE CABLE FAULT LOCATOR WINS APPROVAL IN A VARIETY OF INDUSTRIES**

A large automobile manufacturing plant, several major power and light companies, a traction company, a well-known oil company, have recently bought Biddle Impulse Cable Fault Locators and D-C Proof Testers. The



broad diversity indicates, in a measure, the wide usefulness and economic advantages of this instrument. A mobile unit that recently toured the country brought much acclaim for the equipment wherever it was demonstrated.

Your correspondence is invited . . . For a detailed description, ask for Bulletin 65-ECM.

*We are constantly publishing new technical bulletins on Biddle Instruments. A complete list of our latest bulletins will be mailed you on request, so that you may check it to bring your files up-to-date.*

## **NOW, A MEGGER® THAT OPERATES TWO WAYS**

### **1. By hand**



Here is the instrument that gives you the greatest facility of insulation resistance testing . . . a regular hand-crank Megger instrument with a separate plug-in rectifier. Use the hand-crank, constant voltage generator for working from place to place around the plant. Use the plug-in rectifier for the repetitive "bench" work type of tests . . . also for the long, time-resistance tests. Rectifier works on any 115 v. 60-cycle outlet. Hand-crank generator is automatically

### **2. By Plug-in Rectifier**

disconnected when you hook up the rectifier.

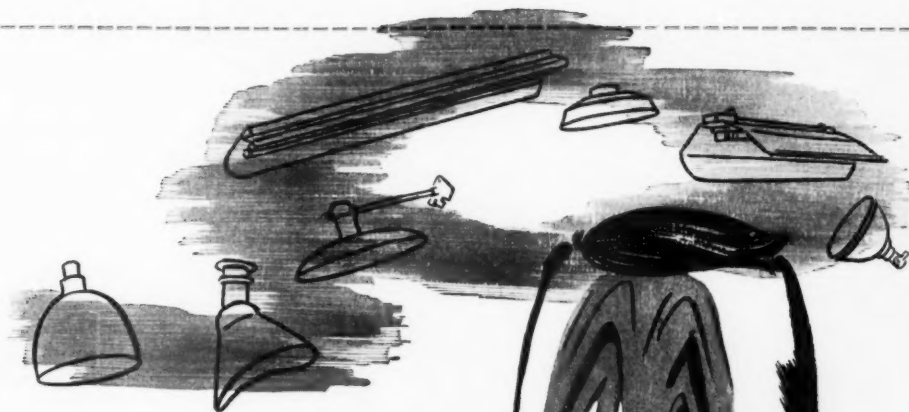
Two important accessory features can be incorporated in the Dual-Operated set by means of a Selector Switch: (1) an Ohm Scale from 0 to 10,000 to augment the regular megohm scale and (2) a Discharge Switch to dissipate D-C charge immediately preceding or following a test.

If you need a Megger tester only for repetitive, production acceptance tests, or for time-resistance testing,

we furnish the Rectifier-Operated Meg type Megger Insulation Tester with built-in transformer and rectifier. No hand-crank; just plug into 115 v. 60 cycles.

For a detailed description, write for Bulletin 21-46-ECM.

YOU CAN BE **SURE**.. IF IT'S  
**Westinghouse**



Don't be a  
**FIXTURE  
PICKER!**



**No wonder he's worried.** He's picking "fixtures". You know fixtures won't solve lighting problems—but *how many other people do?*

It takes expert planning by qualified engineers to solve lighting problems and give you the Best Buy in Lighting.

Whether you plan lighting, buy lighting, or install lighting, the services of a Westinghouse Lighting Engineer are available to you.

An introduction to one of the many fixtures which Westinghouse offers to meet your demands can be had by writing for Booklet B-5254, Westinghouse Electric Corporation, 511 Wood Street, Box 868, Pittsburgh 30, Pennsylvania. J-04282-B



**Westinghouse**  
**PLANNED  
LIGHTING  
PAYS**

## Uses Monowatt Wiring Devices Exclusively in Giant Lakewood Housing Project



**"Easier to install and owner gets a better device" ...**

says J. S. Kuster (right), co-owner and general manager of Kuster-Wetzel Electric Co., of Long Beach, Cal. "Bob" Sammons, superintendent, is shown with Kuster.



Jim Kuster didn't take wiring devices for granted when he began work on the 17,000 house project at Lakewood, Cal. He tried different methods and makes. On the basis of his results, he decided to standardize on Monowatt. Says Kuster—after using the devices for more than a year—"We find that these devices can be installed easier and faster. The customer gets a better grade of wiring device in his new home than is possible with any other competitive grade of devices. What's more, stocking and handling problems are minimized."

Kuster-Wetzel are especially enthusiastic about

Monowatt's combination devices and plates which come in one easy-to-install unit. These are just a few of a whole line of products that have been simplified and improved by Monowatt for speedier installation and better service on the job. Why not take a look at the new look in wiring devices? Send postcard for free catalog to Dept. A-4, Monowatt Incorporated, 66 Bissell St., Providence, R. I.



«Electrician installing a switch and plate combination. When unit has been screwed into box, the job is complete... no need for a second call to install the plate. Other items include switch, pilot light, and outlet combinations.



MONOWATT INCORPORATED • A GENERAL ELECTRIC AFFILIATE • PROVIDENCE 7, R. I.

# JANUARY . . . at a Glance

## Copper-Aluminum

End-use prohibitions on copper and aluminum will soon be issued, and will restrict certain construction uses. The original cut-back order already extends beyond the manufacturer to the contractor. During January and February, a contractor may use for non-defense work only 85 percent of his average monthly use during the first six months of 1950. In March the allowance drops to 80 percent. Prohibitions to come this month will further specify the end uses to be curtailed.

Provisions for identifying defense work are still not clear to those who are two or more steps removed from the original order. Undoubtedly, this situation will be improved as industry learns the ropes on the extension of DO ratings.

Since construction industry uses are a large proportion, about 20 percent of total copper use, some must be cut back but it is hoped that electrical uses will not have to take the degree of restriction that will be imposed where other materials can be substituted.

## Successful Service

What are the factors that contribute to a successful industrial service organization? Hugh Scott presents the formula this month of the Pacific Electric Company of Oakland, California, and describes how this organization has built one of the finest industrial service operations in the country. The story begins on page 42.

## Lighting Care

Judging by the many inquiries we get about contract maintenance of lighting systems, B. C. Cooper's story about the Fluorescent Service Company of Washington, D. C., will attract wide interest. The company serves more than 200 business concerns in the Capitol on a contract basis. Planning and good records are a vital part of handling such work methodically and properly. Mr. Cooper's article, "Contract Maintenance of Lighting Systems" describes the methods and records used on a model operation.

## The Outlook

Every year at this time we study year end reports, mull over available statistics and try to make a fair appraisal of the months ahead for the industry. This year the task is complicated by the progress in mobilization controls, which, by executive order, can alter the whole construction outlook in a day.

Even with controls, however, the activities of a great industry have tremendous inertia. That is why it is possible to make reasonably accurate predictions of the future course from recent trends. In general, there is little question that a good share of electrical work planned and contracted for will be continued to completion. A conversion to defense production in industry inevitably involves a large amount of electrical work and the materials and manpower must be provided. Mobilization will place many hurdles in the way of normal commerce but will not in the foreseeable future, dry it up.

With all this in mind, we have set forth our outlook appraisal this year and appended to it the current picture of the mobilization controls as they affect us today.

## Residential

Estimates on the value of private residential construction likely to be started in 1951 vary considerably, the latest government figure is down 46 percent from 1950. That works out to about 700,000 units from the 1,300,000 estimated starts in 1950, still a very large market for wiring.

## Estimating

Labor units for finishing operations are included in the eleventh article in our series on "How to Estimate Electrical Work", appearing this month. In answer to many requests, upon the completion of the basic labor unit data in another month, we are planning to make the full series available in reprint form at a nominal cost. The series will continue, however, with case studies of actual estimates using the methods and data of the first 12 articles.

Ray Ashley raises a point of criticism which we have published

with the article this month. His comment adds further emphasis to repeated warnings through the series that the methods, the operators and an adequate check against actual individual practice is essential to the use of the published units.

## New Features

This month we begin two new series of articles, Electrical Design Details and Quick Estimates. Both are the work of consulting engineer Wallace M. Adache of Cleveland, and are taken from an original book manuscript. Electrical Design Details are a ready reference for the engineer, contractor or draftsman who prepares original electrical plans or working drawings. Quick Estimates are rough overall installed costs for the guidance of engineers and contractors who need such data for appraisals, project budgets, and preliminary estimates. Carl Johnson, electrical engineer, New York Port Authority, is assisting the author and the editors in preparing the articles from the original manuscript material.

## Motor Tests

Tests for rotating electrical equipment are featured in the Industrial Electrification department this month. Loren Jones of the National Electrical Coil Company has prepared for us a careful evaluation of available test procedures for rotating electrical equipment and an explanation of the factors which must be considered when interpreting test results. We think that all those concerned with shop test problems will find in Mr. Jones' article a very useful evaluation of their own test procedures and many ideas for improving them. The article begins on page 61.

## Infra-Red

Compact heat for lacquer drying on cast metal parts is the subject of R. F. Gengler's "Compact Infra-Red Heating" on page 44. The application involves close fitting in confined space and an ingenious use of a percentage times and control dial to adjust to various sizes of parts and types of lacquer for specific production runs.



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## **Other Horizons**

**HORIZONS** of the electrical industry are blocked off in some directions by the urgent needs of mobilization. But 1951 will be a year of considerable electrical progress. The industry always moves forward, the enthusiastic servant of peaceful industry and commerce, the mighty aid of the national will in danger. Mobilization will need power and precision, and electrical men are constantly finding new ways to do a better job.

**INDUSTRIAL CONVERSION** is going to be a big job in the months ahead. But we start from an advanced base. The past ten years have witnessed a revolution in industrial plant electrical distribution methods. In that time, primary distribution, package substations, air cooled transformers, bus systems, primary and secondary networks, dual distribution, fifty footcandles and upward of general illumination have become conventional design considerations.

**WE HAVE THE MEANS** of distributing, safely and economically of critical materials, much larger quantities of power in a highly flexible and efficient pattern to industrial utilization requirements. And anyone with an eye to electrical history will realize that these means are only current manifestations of trends with major developments still before us.

**IN ANOTHER ASPECT** of industrial conversion, and one which has a direct influence on productive capacity, we are only beginning. Control and instrumentation, centralized operation and supervision are highly developed in a few technical industries, notably the chemical industry, but the field is still wide open for further application. It will take electrical men with a knowledge of control components and their hookups to seek out these applications and put the genius of our industry to work on practical production problems.

**FOR THE STILL GREAT VOLUME** of work that will go ahead in commercial, institutional and residential building, the pressure on management is going to become much more severe. Material shortage and procurement difficulties will slow down operations and threaten job efficiency. It will take well planned expediting, carefully worked out schedules, and efficient tooling to meet the challenge.

**IN RE-LIGHTING**, modernization, new services and the many other every day jobs, availability of materials and supplies are going to be decisive. But we are still a long way from critical scarcity. Such work should be pushed and promoted as vigorously as we know how, so long as it does not interfere with urgent mobilization requirements. There are still great areas of challenge and possible achievement, in design, application and ingenuity, under far more stringent restrictions than we are likely to see this year.

*William T. Stuart*



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## TRENDS FOR '51

**ELECTRICAL WORK** will total near 1950 levels in dollars, somewhat less in physical volume.

**MANPOWER** will decline with military inroads but man-hours will be greater.

**MATERIAL SHORTAGE** will become much more acute with copper the ultimate bottleneck.

**SUBSTITUTES**, emergency specifications and codes will be reviewed again and probably in use before year end.

**MOST URGENT** work will be in-plant changes and modernization of electrical facilities.

**MOST SPECTACULAR** new construction will be "special weapons" facilities carrying the highest priority.

**PUBLIC BUILDING** authorizations show no tendency to decline but may encounter material delays.

**TIGHT CONTROLS** will limit but not stop a considerable volume of normal construction activity.

# OUTLOOK FOR '51

Volume outlook excellent but subject to many drastic changes during the year.

**I**MPACT of mobilization programs and controls will be the deciding factor in the electrical business outlook this year. At virtually every level they will affect construction, alterations, maintenance and repair markets. But, on the whole, the market will be close to the maximum that can be achieved with available manpower and a declining availability of needed materials. Of these, the most critical bottleneck, for the coming year, appears to be copper.

The projections in our table this year must be viewed in the context of radical changes in the economic environment and the shift of emphasis resulting from mobilization. The totals are likely to come close, but the individual categories can vary substantially from those shown. The ordinary forces which determine how many houses will be built, or how many schools, or street lights or doorbells installed are subject to the prior needs of industrial production and military requirements. The total resources of the industry will be used in one way or another. But the projects or services can change from month to month.

The general areas covered by this outlook include:

1. Electrical work required for new construction of all kinds.
2. Electrical work required for rebuilding or structural modernization.
3. Electrical work required for installation of machinery, equipment, appliances and services.
4. Apparatus, lighting, heating and other utilization and control installations which normally flow through electrical construction trade channels.
5. Maintenance and repairs of electrical systems and apparatus handled by skilled electricians.

The unprecedented pace of electrical work in the closing months of 1950 cut into inventories during a period when mobilization requirements, outside of stockpiling, were not a large factor. The materials available this year will decline as greater quantities of raw materials are diverted to defense needs. Manpower will be cut by the needs of the armed forces but its effectiveness can be extended by longer work weeks and overtime.

Increased costs and the inevitable inefficiencies of difficult procurement will bring considerably higher prices, in the order of 18 percent over mid '50, maybe more. The effect market-wise will be higher dollar volume even if shortages cut down physical volume of work in place. Escalator clauses and negotiated contracts will be increasingly common as accurate cost prediction becomes more difficult.

Residential work will be cut back shortly by credit controls and possibly by further restriction under the construction order. The 600,000 starts predicted for 1951 are still a very large number for any year. On the average, there is a good chance, too, that they will be better wired.

Commercial construction, in essential categories, is not likely to be cut off in the immediate future. Institutional programs are going ahead and there are no signs at this time that substantial cutbacks are in prospect. Some projects have had to be sent back for more appropriations, but schools, hospitals and the like will still provide a large market for electrical work this year.

## TABLE I—NATIONAL PRODUCTION AUTHORITY

### Orders and Regulations

#### REG. 1—Inventory Control—Sept. 18, 1950

Limits quantities of materials (listed in Table I of the Regulation) in short supply that can be ordered, received, or delivered. Materials included in Table I are: building materials, chemicals, forest products, iron and steel, metals and minerals, rubber materials, textile materials (in sizes, shapes, etc., as listed).

#### REG. 2—Basic Rules of the Priorities System (Amended)—Nov. 16, 1950

States the basic rules of the priorities system to be administered by NPA, what kind of orders are rated orders, how to place them, and the preference status of such orders. Authorizes a single rating, known as "DO rating."

#### REG. 3—Operations of the Priorities Systems Between Canada and the United States—Nov. 8, 1950

Describes how and to what extent contracts and orders required to support either United States or Canadian defense programs may have the benefits of the priorities system of the United States.

#### ORDER M-1—Steel—October 12, 1950

Sets forth specific rules for the placing, accepting and scheduling of orders for various steel products which have been assigned a "DO" priority rating.

#### ORDER M-2—Rubber—Nov. 1, 1950

Specifically limits the use of natural rubber during November and December of 1950, to make more natural rubber available for the Government's stock pile. (Replaces Dept. of Commerce Order R-1, established under provisions of the Rubber Act of 1950).

#### ORDER M-3—Columbium Bearing Steel—Oct. 19, 1950

Reserves entire production and use of columbium bearing stainless steels for defense needs ("DO" orders).

#### ORDER M-4—Construction (Amended)—Nov. 15, 1950

Prohibits the construction of buildings or structures for amusement, recreational or entertainment purposes, including approximately 50 types of buildings named specifically in "List A—Prohibited Construction."

#### ORDER M-5—Aluminum—Oct. 27, 1950

Establishes rules for handling defense orders for aluminum under NPA priorities system and provides for equitable distribution of defense orders among aluminum producers, fabricators, distributors, and jobbers.

#### ORDER M-6—Steel Distributors (Amended)—Dec. 1, 1950

Provides rules to assist steel distributors in obtaining steel supplies, and special rules for extension of "DO" rated orders. Also requires steel producers to establish regular allotments of steel for purchase by steel distributors, and establishes basis for allotments.

#### ORDER M-7—Use of Aluminum—Nov. 3, 1950

Designed to provide the necessary quantities of aluminum for defense orders, and for equitable distribution among all users of the aluminum available after defense requirements are met.

#### ORDER M-8—Tin—Nov. 3, 1950

Establishes rules for reporting on inventories, receipts, consumption, imports and distribution of tin, and limits inventories of alloys and other materials containing tin.

#### ORDER M-9—Zinc—Nov. 16, 1950

Sets up rules for producers and fabricators of zinc and dealers in zinc and zinc products for accepting and scheduling "DO" rated orders for zinc.

#### ORDER M-10—Cobalt—Nov. 30, 1950

Establishes specific inventory limitations for cobalt.

#### ORDER M-11—(Subpart A—General) Copper and Copper-Base Alloys—Nov. 29, 1950

Establishes rules for accepting and scheduling rated defense orders for copper and copper-base alloys to provide uniform distribution of such orders through established channels.

#### ORDER M-12—Copper and Copper-Base Alloys—(Subpart B—Use of Copper and Copper-Base Alloy)—Nov. 29, 1950

Designed to provide the necessary quantities of copper and copper-base alloys for defense orders, and for equitable distribution among users of that part of the copper supply which is available after meeting defense requirements.

Industrial work will set some new records. It is worth noting, however, that the mobilization program at the outset will depend largely on existing "bricks and mortar", the plants that were used for military production in World War II. New industrial plant requirements will probably be dominated by "special weapon" developments.

In-plant changes, modernization and alterations to adopt to new production requirements are probably the most urgent electrical requirements of the early months of 1951. Much of this work will go ahead even before military orders are on hand.

Such work presents a very serious priority problem. If a major shooting war holds off, the electrical requirements of in-plant changes may rank in strategic importance ahead of some direct military needs, since they bear directly on productive capacity.

Major appliance installation, which requires new service capacity and special branch circuits has boomed tremendously in the past year. Some curtailment of appliance manufacture is almost certain to come this year and will have an effect on wiring requirements for installation. Such a cutback of range wiring and the like will be more than offset, however, by the greatly increased requirements for industrial apparatus installations.

### Controls

Since the market outlook is so closely allied to the progress of mobilization and economic controls, the current status and the general course of these programs is an essential part of the picture.

The National Production Authority, established originally under the jurisdiction of the Department of Commerce and now a part of the Office of Defense Mobilization, has been delegated the powers of *Title I: Priorities and Allocations*, under the terms of the Defense Production Act of 1950. Under these powers it can require that contracts or orders (excluding contracts for labor) necessary to the national defense be given priority over all other work. Also, it can require the acceptance and performance of such contracts by selected persons, and allocate materials and facilities as necessary to promote the national defense.

Under these broad powers, NPA has already issued several orders and regulations (see Table I). As one of its first acts, it drew up a list of critical raw materials which it incorporated in



an Inventory Control order (NPA Reg. 1—Sept. 18, 1950). Out of this list of raw materials, metals have been the items which have subsequently received the maximum attention, and have been brought under a variety of controls. Of the other critical items, NPA has found it necessary to put direct controls on only rubber and high tenacity yarn.

All materials, including those on the critical list, were made subject to the first controls device, a single-band priority system designed to provide the armed forces with the equipment it needed. NPA authorized first the Department of Defense, then the Atomic Energy Commission and other defense agencies, to apply DO (defense order) priorities on contracts for virtually everything they needed.

It is these NPA regulations, orders, controls, and priorities, already issued and yet to come, with which the electrical construction and maintenance industries will be most concerned, now, and for the duration of the emergency (or World War III).

Basic objectives of the Administration and Defense Production Act agencies have been to superimpose the defense production program on the civilian economy with the least possible disruption of the civilian economy, over as long a period as possible, and to curb inflation resulting from increased national income during a period when civilian goods (refrigerators, television sets, radios, etc.) were decreasing in supply. To aid in this program every effort has been made to increase industrial capacity—from steel, aluminum, and copper mills all the way back to fabricators of durable goods. This program prevailed through to mid-December, and may be termed the "easy" stage of controls and regulations, at which time the President declared a national emergency due to the turn of events due to Chinese Communist intervention in Korea and other Red aggression. This initiated the "intermediate" stage of economic and industrial controls, requiring a stepped-up defense production program, with the first stages of price controls and subsequent wage controls in the making. Just how long it will be before the third, or "all-out" stage is reached depends on the Communist aggressors.

#### Defense Order (DO) Ratings

The single-band (DO) priority ratings have been assigned in groups by NPA to the several defense agencies, and each assigns procurement

### ESTIMATED ELECTRICAL CONSTRUCTION

| Type of Construction                       | (Millions of Dollars) |             |
|--|-----------------------|-------------|
|  | Revised 1950          | 1951        |
| Private—New York                           |                       |             |
| Residential (non-farm).....                | 616                   | 425         |
| Farm.....                                  | 47                    | 58          |
| Industrial.....                            | 100                   | 240         |
| Warehouse, office and loft                 |                       |             |
| Stores, restaurants, garages               |                       |             |
| Misc., Non-residential.....                | 232                   | 210         |
| Railroads.....                             | 21                    | 24          |
| Telephone & Telegraph.....                 | 45                    | 52          |
| Utilities.....                             | 240                   | 280         |
| <b>Total Private.....</b>                  | <b>1301</b>           | <b>1289</b> |
| Public—New York                            |                       |             |
| Residential.....                           | 35                    | 46          |
| Educational.....                           | 105                   | 120         |
| Hospital & Institutional.....              | 65                    | 86          |
| Other non-residential.....                 | 40                    | 46          |
| Military & naval.....                      | 5                     | 23          |
| Highway.....                               | 57                    | 69          |
| Sewer and water.....                       | 32                    | 37          |
| Misc. public service.....                  | 5                     | 6           |
| Conservation & development.....            | 45                    | 52          |
| All other public.....                      | 11                    | 13          |
| <b>Total Public.....</b>                   | <b>403</b>            | <b>498</b>  |
| <b>TOTAL NEW CONSTRUCTION.....</b>         | <b>1701</b>           | <b>1787</b> |
| Modernization and Repair                   |                       |             |
| Service replacement.....                   | 85                    | 100         |
| Appliance circuits.....                    | 65                    | 82          |
| Rewiring.....                              | 120                   | 260         |
| Relighting.....                            | 190                   | 250         |
| Repairs and replacements.....              | 50                    | 69          |
| <b>Total Modernization and Repair.....</b> | <b>510</b>            | <b>761</b>  |
| <b>TOTAL ALL.....</b>                      | <b>2211</b>           | <b>2548</b> |

categories for their several numbers. Two digits are used following the "DO", e.g., DO-39, to form the "priority rating", and to identify the procurement program. Two "basket" designations were also established: DO-98 for production equipment, including machine tools; and DO-99 for shelf items and others required in amounts less than those recognized as minimum deliverable commercial quantities.

Of special interest to the electrical construction industry are the following DO ratings:

- DO-22 Construction (contract), assigned by the Department of Defense.
- DO-41 Construction, except construction equipment, assigned by Atomic Energy Commission.
- DO-51 Construction, assigned by the National Advisory Committee for Aeronautics.
- DO-62 Construction, assigned by U. S. Coast Guard.

Building construction contracts made by either of the above federal agencies may be assigned "DO" priorities, using the DO-number indicated for each

agency. When contracts are so made, the prime contractor may extend this rating to a sub-contractor (the electrical contractor, for example), and the sub-contractor in turn, may extend the rating to his supplier to get delivery of the materials, components, parts or products he needs.

NPA has adopted the single-band priority system in preference to multiple priorities, where one overrides another, as was the case of War Production Board priorities during World War II. Reason is that the single-band priority is now used primarily to insure delivery on schedule (a time element) rather than as a means of allocation of materials to production programs based on related essentiality (a distribution element). As priority production is stepped up, however, it is believed that the single-band priority will become inadequate, and a controlled materials plan (CMP of WPB type) will finally be adopted. Need for this type of control can probably be justified by mid-year. A narrow band priority system will no doubt then be found necessary to implement CMP, and to provide a basis for allo-

(Continued on Page 151)

# How to Estimate Electrical Work—11

By W. T. Stuart

## Labor units for finishing operations on new construction work.

One of the easiest areas of electrical construction work for obtaining exact time studies is in the finishing operations. The working areas are usually clear and reasonably clean. The items installed are readily identified by visual inspection. The finishing operations are usually distinct and easily separated from other job activities, and at this stage of the job interference between trades is less likely to influence the progress of the work.

It is just for this reason, the ease with which good data may be accumulated that many estimators will underestimate this portion of the job. It is in the finishing stage where the difference between "stop-watch" time studies and labor units can cause trouble. In simplest terms, this distinction can be defined as follows:

Time study—the net labor hours required for a specific installation of one or more like items reduced to a basic time study unit. Labor unit—the allocation of total job man-hours to a group of like items reduced to a basic labor unit.

On finishing work, the labor unit will always be much greater than the time study because it is at this stage of the job where the tag ends are picked up, circuit complexities ironed out, missing covers installed, mistakes rectified and all the thousand and one little clean-up tasks necessary to leave the job in working condition are completed. A good share of this labor must fall on the components which are normally installed at this stage.

The more efficient the management operation, the more closely labor units can approach time study units, but even on the best managed operations there will still be a wide margin between them.

### Fastenings

A few units are given here for fastening operations. They are typical but the estimator will be well advised to make his own studies. In recent years, the mechanization of fastening operations has progressed to a point where it is uneconomical to tackle even a few shield inserts without a power hammer or drill.

Powder actuated tools, by means of which inserts are driven with explosive force into the supporting material can reduce fastening time to a negligible level under optimum conditions. For estimating purposes, however, the estimator should have some substantial background of job experience with such tools before attempting to assign very low time elements inherent in the operation of the tool. The influence of individual skill and job conditions can be important.

The same is true of other modern power tools with high speed masonry bits or super-hard cutting edges, the skill and judgment of the user becomes a factor of increasing importance as inherent drilling speeds increase. We have seen a number of studies of fastening time with various types of tools and equipment but they do not present apparent averages to provide units.

### Wiring Devices

The tables for switches and receptacles show labor units for representative types of devices under ordinary job conditions. Some small variations may be made in these items for special design details that make for easier installation. For other devices not listed, the estimator can develop his own units from the nearest similar device.

For combinations of devices as a single plate, most estimators use the full unit, however, if they occur in considerable numbers, special units can be made up by deducting .06 hours from each unit and adding .1 hours to the combination under each plate.

For instance, 3 single pole switches one plate would take .32 minus .06 or .26 times 3 or .78 plus .10 equalling .88 for the combination unit.

On some installations the plates are withheld until the work is substantially finished. This practice is particularly desirable where special finishes are involved or where there is some probability of marring or damage. If plates are applied as a separate operation, an additional unit of .04 should be added.

Some new devices have the receptacle and plate moulded as a unit. For such devices the unit can be reduced by .04 hours.

### Fixtures

The fixture units shown are for some representative types. From time to time we shall add additional items to this tabulation. The types chosen are among the most common in commercial, institutional and industrial installations. They may also be used as keys for other types which require similar installation details.

A footnote to the fixture units should be carefully noted. Where there are 4 or ten of a particular fixture type, the unit should be doubled. Experienced estimators will readily recognize the logic of this treatment. It is the old job problem of the "special" item. In a roomful of fixtures, one is of special design, or has a canopy switch or a special suspension. So costs rise due to the special handling these one or two fixtures must have.

## 11. FASTENINGS

| Fastenings and supports                             | man hours<br>each |       |
|---|-------------------|-------|
| Inserts, concrete, spotted and nailed to forms..... | .16               |       |
|   | Concrete          | Brick |
| 3/16 in. shield and machine screw.....              | .06               | .05   |
| 1/4 in. shield and machine screw.....               | .065              | .055  |
| 3/8 in. shield and machine screw.....               | .075              | .06   |
| 1/2 in. shield and machine screw.....               | .08               | .065  |

Above units are typical for power hammer and drill in readily accessible face with minimum set up time. The variety of tools, bits, plugs, shields, anchors and studs employed for fastenings is very large. Installation time varies with the nature of the supporting material, the equipment used and the type of fastener.

For powder-actuated tools and studs in approved locations in suitable materials and with expert handling fastening time is often a negligible item.

## 12. DEVICES

| 12a. Switches including plates        | man hours<br>each |  |
|---------------------------------------|-------------------|--|
| Single pole, flush tumbler.....       | .32               |  |
| 3 way " " " ".....                    | .42               |  |
| 4 way " " " ".....                    | .52               |  |
| Double pole " " " ".....              | .52               |  |
| Door " " " ".....                     | .38               |  |
| Canopy " " " ".....                   | .40               |  |
| Ceiling pull " " " ".....             | .52               |  |
| Control station, 3 wire, flush.....   | .42               |  |
| Momentary contact, 2 wire, flush..... | .32               |  |

| 12b. Receptacles                          | man hours<br>each |  |
|---|-------------------|--|
| Flush type with plate                     |                   |  |
| 2 pole, twin or triple, 15 amp            |                   |  |
| 2 wire circuit.....                       | .32               |  |
| 3 wire (split feed).....                  | .42               |  |
| 3 pole, grounding, single or twin 15 amp. |                   |  |
| 2 wire circuit.....                       | .32               |  |
| 3 pole, single, 15 amp.....               | .42               |  |
| 3 wire circuit.....                       | .65               |  |
| 3 pole, single, 20 amp.....               | .75               |  |
| 3 pole, single, 30 amp.....               | 1.05              |  |
| 3 pole, single, 50 amp.....               | .75               |  |
| 4 pole, single, 20 amp.....               | .42               |  |
| Pilot light.....                          |                   |  |

### Receptacles

#### Surface type

|                             |     |
|-----------------------------|-----|
| 2 pole, twin, 15 amp.....   | .29 |
| 3 pole, single, 15 amp..... | .39 |
| 4 pole, single, 20 amp..... | .70 |
| 3 pole, single, 50 amp..... | .95 |

### Notes:

1. If plates are installed at the same time as device, above units apply.
2. If plates are applied as a separate operation, add .04 hours per plate to above units.
3. On surface type devices, units include mounting on appropriate box cover, but do not include outlet labor.

## 13. FIXTURES

|   | man hours |     |
|---|-----------|-----|
| Drop cord, outlet box cover, bushing, cord and socket.....  | .45       |     |
| with metal reflector.....   | .58       |     |
| with reflector and guard.....   | .67       |     |
| Outlet box cover lamp receptacle.....   | .34       |     |
| with metal reflector.....   | .47       |     |
| with reflector and guard.....   | .56       |     |
| Ceiling unit 300 w. and enclosing glass, incandescent.....  | .54       |     |
| Suspended unit 300 w. and enclosing glass, incandescent.....  | .78       |     |
| Ceiling or suspended fluorescent commercial sockets and ballast pre-wired, 4-40 watt unit with glass or plastic panels..... | 1.35      |     |
| Fluorescent commercial ceiling or suspended, unwired, 4-40 watt unit with glass or plastic panels.....                      | 2.25      |     |
| RLM ceiling unit 300 w., incandescent.....  | .52       |     |
| RLM stem suspended 300 w., incandescent.....  | .75       |     |
| with cover or enclosing glass.....  | .95       |     |
| Fluorescent industrial unit 2-40 watt suspended, ballast and sockets prewired.....  | 1.25      |     |
| Fluorescent industrial unit, 2-40 watt suspended, unwired.....  | 2.15      |     |
| Wall bracket, stud on strap support.....  | .54       |     |
| Exit lights, surface mounting.....  | .54       |     |
| Exit lights flush mounting.....   | .85       |     |
| Flush or semi-flush ceiling units 12 x 12 incandescent  | 1.05      |     |
| Flush troffer units, fluorescent 2-40 watt  |           |     |
| Open.....   | per foot  | .60 |
| Glassed or louvered.....  | per foot  | .72 |
| Lamps.....  |           | .08 |

### Notes:

1. When the total job quantity of any fixture type is 4 or less, double the unit.
2. Flush units with boxes roughed in should also be included as outlets in roughing-in take-off.
3. Units assume conventional step ladder or scaffold access to the outlets. For high bay work or other special conditions, an additional amount should be added to cover the particular access problem.

| 2c. E. M. T. (Alternate)                                | man hours |      |           |
|---|-----------|------|-----------|
| In suspended ceiling                                    | 1/2 in.   | 4.80 | per C ft. |
| Runs affected by structural and other mechanical trades | 3/4 in.   | 5.00 | per C ft. |
|   | 1 in.     | 5.10 | per C ft. |
| Outlets   | ceiling   | 65   | per C     |
|   | wall      | 70   | per C     |

### Ashley Comments

I have followed your series on "How to Estimate Electrical Work" for the past several months with considerable interest. I feel that educational effort in the field of good estimating practice is of the utmost importance for the future of the industry. And certainly the need is there, if current demand to my book "Electrical Estimating" is indicative.

However, there are some points on which I cannot agree with your work, and I would like to offer these comments by way of constructive criticism.

Your units are presented as "bare" which are adjusted upward by means of operators or footnotes to working values. In my experience, I find that estimators try to use units "as is" and are more than likely to ignore your operators or other warnings.

From a great many years of wrestling with just this kind of data, I am convinced that labor units should contain a margin of reasonable safety for the unwary. A unit cannot be considered a representative cost unless it is substantial enough to warrant the application of a factor or "operator" to reduce it, when more favorable working conditions are anticipated.

Would it not be well to present, so long as your series is already based on bare units, other values in another column which can be classified as "safe" for direct use?

Units in your October issue pertaining to ceiling outlets look too low to me, lower than my experience would prompt me to use. With the operators, they are still lower than N.E.C.A. manual values. The same is true of your suspended ceiling data. The electrical contractor does not have much control over the pace of this kind of work and is obliged to work with other trades on the same platform. I have yet to find a contractor whose costs were not high for this type of work.

—Yours for better estimating,

Ray Ashley



Ray Ashley's comments are most welcome and, as usual, very much to the point. Ashley's authoritative articles on electrical estimating have appeared over many years, and his book, "Electrical Estimating" is already a classic in the field.

Our contention is that "bare" units are most practical because of their inherent simplicity. The estimator usually works from "net" costs. Should a column of "safe" units be added to the bare units? A good question, and we would appreciate our readers' views.

Ashley questions some of our data. The test of these, of course, is your verification tests as outlined in the August issue. It is well to emphasize here that if this verification method is used, other variations in the data to match actual individual job experience may be found desirable.

As we have pointed out before, the estimating process is one which is devoted to finding the true probable cost for the wiring of a specific project. The data which the estimator uses must fit or be adjusted to fit his own job methods and experience. Our labor units or any other good set of labor units can be readily measured and fitted to individual experience by methods previously described.

—W. T. Stuart

Among comments received on this series of labor unit data are some from Ray Ashley, whose writings in the field of electrical estimating are well known throughout the industry. We have quoted his letter at length elsewhere on these pages. One point he raises refers to the units given for suspended ceiling work (Tables 1-c and 2-c, *Electrical Construction and Maintenance*, page 60, October 1950). These units are for conduit and EMT respectively in suspended ceilings. However, it should be noted that the units are further described as "straight run with minimum bend," or the best conditions which are likely to be encountered on suspended ceiling work. In the accompanying Table 2-c, EMT alternate is presented in alternate sets of units for conditions where the electrical work must be installed when structural features and other mechanical installations complicate the work. It will be noted that these units carry considerably more weight on the tubing and more on the ceiling units than on the original table.

A like alternate to 1-c rigid conduit would increase the conduit units to 5.20, 6.00, and 7.70 for  $\frac{1}{2}$ ,  $\frac{3}{4}$  and 1 inch respectively, with 65 for the ceiling outlets and 70 for the wall outlets.

Suspended ceiling work, as Ashley quite correctly notes, is an area where many contractors find their costs running high. Principally, this is a result of the widely variable conditions of interference likely to be encountered on the job. Piping for plumbing, heating, sprinklers; duct and outlets for air conditioning and ventilation; acoustical treatments and flush lighting units are all influencing factors in the wiring layout and installation. They also challenge any attempt to average out installation costs. However, the tables given, weighted by the estimator's knowledge of the conditions most likely to be found, can still give accurate estimates.

It is, of course, entirely practical to refine the data tables to cover many different types of structures and conditions encountered. Many estimators prepare tables for specialized conditions frequently met on types of work in which they specialize. For the first part of this series, however, the data is intended to cover average conditions widely found on jobs of moderate size. Further refinement to particular types of projects is most desirable and we hope many of our readers will expand on these data.

# Electrical Design Details

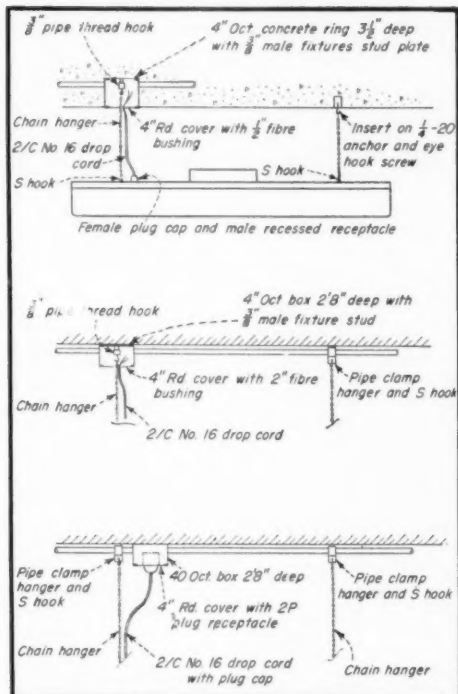
Beginning a series of electrical design details for engineers and contractors; useful for the preparation of project plans or working drawings.

By Wallace M. Adache\*  
Adache & Case, Engineers  
Cleveland, Ohio

## 1.—Industrial Fluorescent Fixture Hangers.

Three methods of installing industrial fluorescent fixtures are illustrated in the detail drawings.

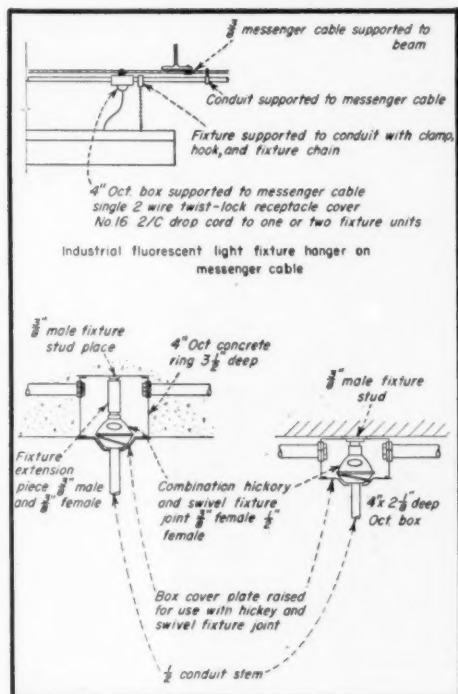
1. Box in slab, suspension from box and from insert or fastening. Fixture is connected by plug cap and recessed receptacle.
2. Conduit and box on surface of ceiling, suspension from box and from pipe clamp. Fixture connection as 1 above.
3. Conduit and box on surface of ceiling, suspension from pipe clamps at both ends of fixture. Fixture is connected through plug receptacle and cap in box cover.



## 2. Industrial Fluorescent Fixture Hangers.

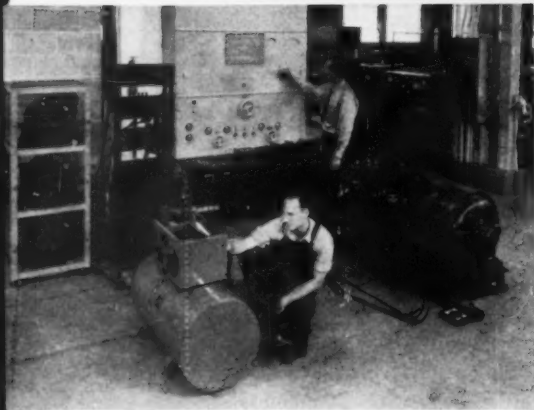
Details of fluorescent fixture hangers on messenger cable and stem suspension of incandescent fixtures.

1. Messengers supported from steel, box and conduit hung on messenger wire. Fixture is hung from pipe clamps and connected to box through a plug receptacle and cap.
2. Box and conduit in slab, fixture is hung on stem with combination hickey and swivel joint at box cover supported by a fixture stud and fixture stud extensions.
3. Box and conduit on surface, fixture is hung on stem with combination hickey and swivel joint at box cover supported by fixture stud.

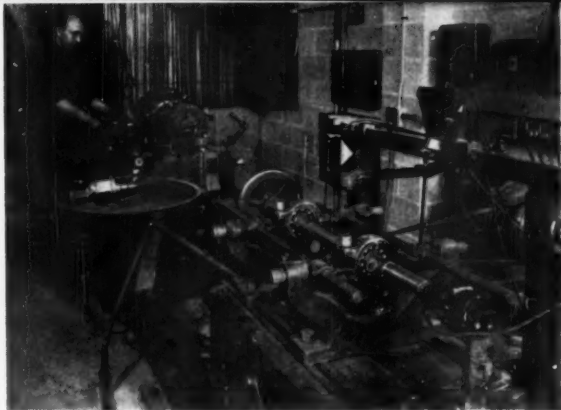


\* Drawing copyright by author and used by permission. Articles are selected abstracts from the manuscript of a forthcoming book on electrical construction design standards.





**TESTING EQUIPMENT** includes a wide variety of modern devices for analyzing, trouble-shooting and final checking.



**DYNAMIC BALANCERS** provide fast and accurate means for locating vibration-producing conditions in rotational equipment.

## Formula For Successful Service

Eleven factors contribute to the lusty growth of the Pacific Electric Motor Company of Oakland, California. They are . . .

- |                                   |                               |
|-----------------------------------|-------------------------------|
| 1 Knowledge of ordinances         | 6 Tools and testing equipment |
| 2 Knowledge of materials          | 7 Transportation facilities   |
| 3 Purchasing Power                | 8 Ample stock                 |
| 4 Reasonable charges              | 9 Round-the-clock service     |
| 5 Diversified abilities           | 10 Competent personnel        |
| 11 Competent electrical engineers |                               |

By Hugh P. Scott

**A**N all-inclusive industrial service organization, staffed and equipped for electrical contracting, motor repair, engineering, maintenance and supply, is located in Oakland, California. Established in 1907 solely for the repair and sales of motors, the company now has a wide reputation in the fields of lighting, wiring, electric heating, explosion-proof installations, substations and special switchgear construction, photocell and relay controls, arc furnaces, cranes and busway systems. Their sales department handles power tools, V-belts, motors and brushes, controls and supplies. Their motor shop serves industrial plants in all parts of the state.

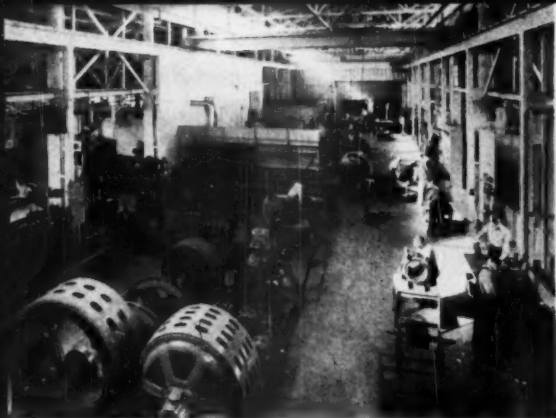
Three things in particular are outstanding in the shop: the layout, equipment and available space. Planned for efficiency, related operations are kept

together, with separate areas used for fractional horsepower motor work, coil formation, large motor repair, machine work and operations associated with construction projects. Segregation is also stressed in warehouse and storage sections, with new and reconditioned motors, replacement parts, conduit, wiring accessories, luminaires and tools individually located and indexed.

Shop equipment includes two dynamic balancing machines for locating points of vibration in such rotating parts as armatures and rotors, fans and pulleys, pump impellers and fly wheels. Baking is performed in shop-fabricated electric ovens, equipped with counterbalanced doors, automatic controls, high-capacity intakes and exhausts, roll-in dollies for large assemblies, and overhead cranes to move equipment between ovens, dip-



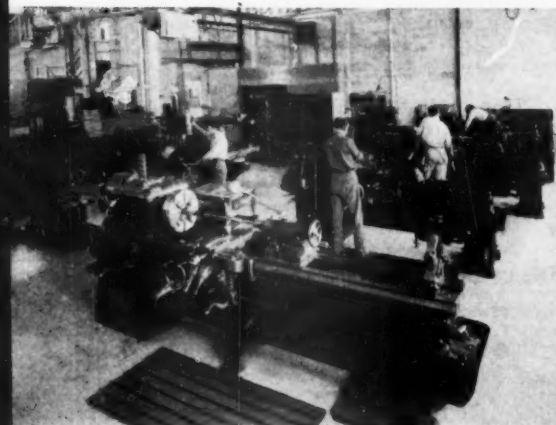
**WELDING** with both arc and acetylene equipment is used for many kinds of repair work.



**CENTER SHOP BAY** has ample room for disassembly and re-assembly of large equipment. Crane has 10-ton capacity.



**MOTOR WINDING** department is adjacent to coil winding shop. Work flows smoothly between repair-assembly areas.



**MACHINE DEPARTMENT** is equipped with precision tools and materials-handling facilities.



**SHIPPING** and receiving is located conveniently between the truck entrance and the comprehensive stock areas.

ping tanks, repair areas or loading platforms.

Metal spraying equipment is used to conserve shafts, to prevent damage to windings of dc armatures by eliminating the necessity of removing shafts, for replacement, and to permit the use of standard sized bearings by building scored shafts back to their designed diameters.

A large assortment of testing equipment, including portable and clamp-on instruments, makes it possible to obtain accurate data in the field as well as in the shop for analysis and checking purposes.

Moving equipment about the shop is handled by four traveling cranes, the largest one with a 10-ton capacity. Shipping large motors to customer premises, moving cable reels and carrying heavy tool boxes to jobsites

is facilitated by hydraulic lift tail gates on the company's two, two-ton trucks. Materials handling is also aided through the use of pallets and industrial lift trucks, with tool boxes and construction equipment stored on the pallets for fast and easy mass movement.

Besides the 3-bay 18,000 sq.ft. shop, the new structure includes a 6,000 sq-ft. office area, a modern engineering department, ample storage sections, efficient shipping facilities and garage space for the company's 7-vehicle fleet.

#### **Comprehensive Service**

Offices and engineering departments are roomy, well lighted, comfortably furnished and modernly equipped. Drafting facilities include a blueprinting machine in addition to

the usual files and drawing aids.

The scope of this organization makes it possible for customers to contact the same firm for repairing or rewiring machinery, obtaining engineering services, installing wiring, manufacturing special switchgear and control panelboards, purchasing electrical supplies, renting welding machines, obtaining new or reused motors and controls, purchasing lighting fixtures or directing the installation of electronic devices.

The owners, Frank Boyd, president, and son Bill, manager, maintain that their growing business is based on three factors; reliability, thoroughness and confidence. Amplifying this statement, they claim that these qualities are obtainable only by (1) a thorough knowledge of national and

(Continued on page 153)



**TWO-MAN** service truck crew cleans and relamps a typical 4-lamp luminaire. John W. Hurt cleans a lamp while Marion Miller (on ladder) cleans the luminaire.

**S**MALL business establishments spend millions of dollars every year for light which they never receive. William Stern, owner of Fluorescent Service Company, Washington, D. C., reached this conclusion long ago. It was this fact which influenced him to organize a fluorescent lighting maintenance service, operated under the above firm name. Now in its third year, it is servicing lighting systems for over 200 commercial and service establishments in the District of Columbia and nearby metropolitan area.

All fluorescent lighting systems are subject to depreciation in light output and loss in lighting efficiency. Accumulation of dirt and dust on the luminaires and lamp tubes is one of the major causes of light loss. Depreciation of the light output as lamps approach the end of their useful life is another. These two factors alone can depreciate a lighting system by as much as 50 percent, if the system is not cleaned periodically and otherwise maintained.

There are also several other factors which depreciate the overall efficiency



**PROSPECT** for fluorescent lighting maintenance is Bruce Emerson, Jr., (left) of Emerson & Orme, Washington dealer for Buick autos. Bill Stern points out benefits of contract maintenance, and closes contract.

## CONTRACT

**Fluorescent Service Company keeps fluorescent lighting systems operating at top efficiency on contract basis for more than 200 business establishments in the Nation's Capital.**

**By Berlon C. Cooper**

of fluorescent lighting systems still further, if not properly maintained. They include low voltage, burned-out lamps, defective ballasts and starter switches, and other similar causes. Owners continue to pay for the total amount of light produced by the system, even though as much as half of it is soaked up due to poor maintenance, and never reaches the areas being lighted.

The maintenance of fluorescent lighting systems is not a simple job for the porter or janitor. Fluorescent lamps are electronic devices, operated by specially-designed auxiliary devices requiring expert attention for best operating results. Thus business establishments too small to justify full time employment of a trained lighting maintenance engineer, have need for the specialized services of such an individual on a part-time basis. Fluorescent Service Company provides just

this type of specialized service, available at all times when needed, and at a minimum cost to the customer.

The operation of a fluorescent lighting maintenance service must of necessity be based on a fairly critical balance between "overhead costs plus reasonable profit" and "reasonable charges for services" rendered to customers. Service must be available to all customers promptly—within one or two hours after notice. Periodic cleanings must be made according to terms of contracts, with as little interference to customers' premises as possible. On the other hand, overhead costs must be kept at a minimum, to keep contract costs as low as possible. Fluorescent Service Company has been staffed and equipped on this basis. Two service trucks are now in operation to serve slightly over 200 accounts, with two maintenance men forming crew for each truck. The

| DATE                  | JOB NUMBER    | NATURE OF WORK DONE | COST OF LABOR | COST OF MATERIALS | TOTAL COST    | COST TO DATE |         |
|-----------------------|---------------|---------------------|---------------|-------------------|---------------|--------------|---------|
| Name _____            |               |                     |               |                   |               |              |         |
| Address _____         |               |                     |               |                   |               |              |         |
| MONTHLY CHG. \$ _____ |               |                     | DATE _____    |                   |               |              |         |
| DATE BILLED           | DATE RECEIVED | AMOUNT              | TO DATE       | DATE BILLED       | DATE RECEIVED | AMOUNT       | TO DATE |
| 1                     |               |                     |               | 1                 |               |              |         |
| 2                     |               |                     |               | 2                 |               |              |         |
| 3                     |               |                     |               | 3                 |               |              |         |
| 4                     |               |                     |               | 4                 |               |              |         |
| 5                     |               |                     |               | 5                 |               |              |         |
| 6                     |               |                     |               | 6                 |               |              |         |

**RECORD CARD** provides simple means for keeping complete record of each contract. Receipts are shown on face of card, and service data, including costs, on back of card.

## MAINTENANCE of Lighting Systems

owner and a secretary complete the staff personnel.

As the name of the firm indicates, Fluorescent Service Company is strictly a "service" organization. It sells maintenance of fluorescent lighting systems. This service is sold on an annual contract basis, at a specified cost "per lamp per month". Once a customer is signed up on an annual contract, the Fluorescent Service Company takes over, and maintains the entire lighting system, from "the ceiling down". On the initial service call, all lamps and lighting equipment are cleaned by washing, burned-out or blackened lamps are replaced, and all defective ballasts, starter switches, lampholders, broken glass or plastic panels, and louvers are replaced. Shorts in the fixture wiring are repaired, and the lighting system is put in first class operating condition. During the contract year all fixtures are again washed and cleaned at two, three or four month intervals, according to the terms of the contract. New lamps are installed to replace burned-out or blackened lamps on each periodic cleaning. In addition, the customer may report any burned-out lamps, defective ballasts or starters, or other troubles which occur between the periodic cleanings, and a truck crew will be dispatched to the job to correct these troubles—same day the

call is received on all calls up to 4:00 P.M.

Before organizing this fluorescent maintenance service, Stern made a detailed study of all types of fluorescent lighting fixtures and lighting equipment, average lamp life for the various sizes and types of fluorescent lamps, different types of ballasts and starter switches, and their influence on lamp life, the effect of air conditioning on dirt and dust accumulation, and the rate of dirt and dust accumulation in different types of interiors. From the results of this study, he worked out a cost schedule, on a cost "per lamp per month" basis over a twelve-month period. All factors affecting light loss were carefully weighed, as well as factors which influence labor costs in maintaining different types of lighting equipment. A varying cost schedule, ranging from 12½¢ to 22.5¢ per lamp per month, based on 40-watt standard fluorescent lamps, was then prepared.

Base for the cost schedule is an installation of unshielded 4/40-watt lamp luminaires in a building with average dirt and dust conditions, which require cleaning at four-month intervals, and are easily accessible from a standard 10-foot stepladder. Cost per lamp per month for such an installation is 15 cents. Shielded fixtures under similar conditions are priced at 17½ cents per lamp per month. Additional

increments are used for other factors which increase labor costs, such as extreme dirt conditions requiring cleaning at more frequent intervals (at 3-month or 2-month intervals), or high ceilings requiring longer ladders or scaffolding, or having to service the installation at night or on weekends when the business establishment is closed.

Thus, all the factors which influence costs, either up or down, are taken into consideration in figuring a contract price. In this way, each customer is quoted a price which is competitive, and which prevents a customer with an easily maintained system from carrying part of the cost which should be borne by other customers having a system which is more difficult or expensive to maintain.

Experience has shown that personal calls are necessary to sell maintenance service. At present, Stern does all of his own selling. He has tried hiring and training salesmen, but none of those hired have been successful. The reason seems to be that they simply don't work hard enough.

Direct mail and telephone solicitation have both been used to develop new prospects. Very little success has been had with direct mail. However, telephone solicitation has proved fairly successful. On one campaign

(Continued on Page 67)

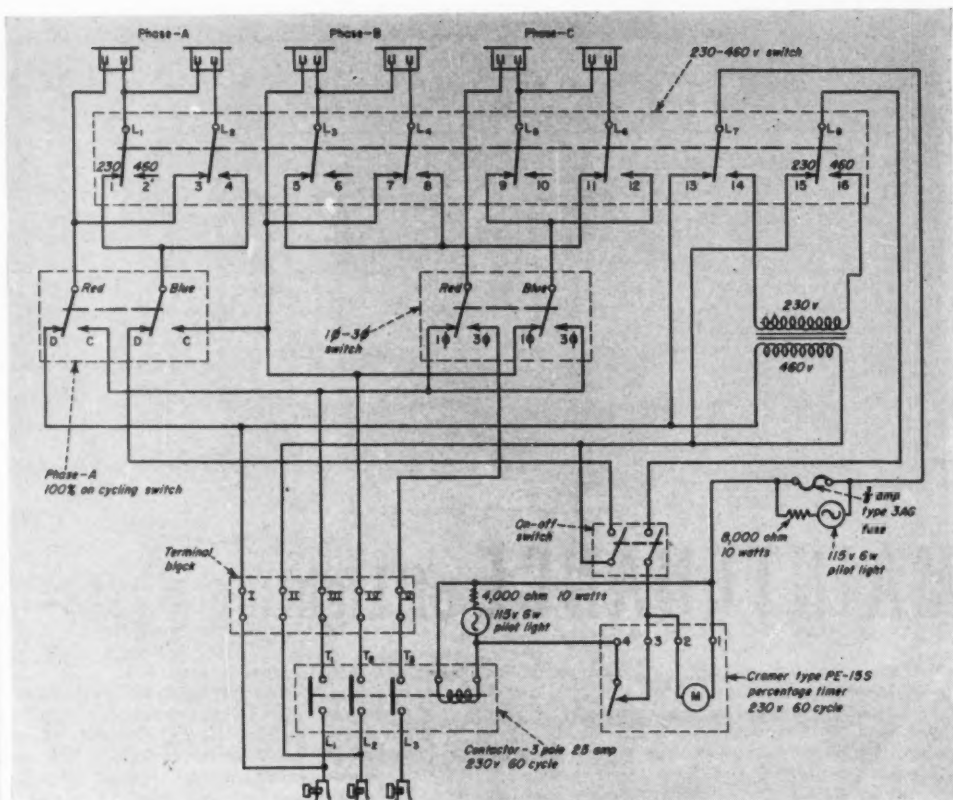


FIG. 1—CIRCUIT DIAGRAM of all-metal infra-red heating installation and percentage timer control of units.

## COMPACT INFRA-RED HEATING

Glass-less infra-red units speed lacquer drying on cast metal parts. Dial control varies heat to suit variety of parts sizes on spray booth conveyor.

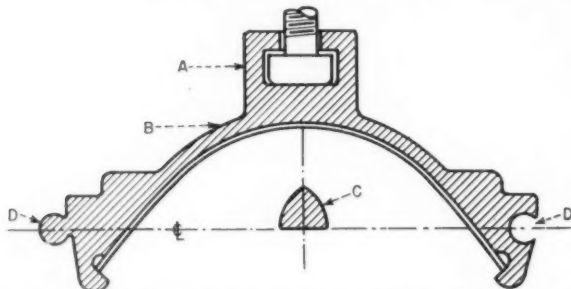


FIG. 2—CROSS-SECTION of all-metal infra-red unit showing (A) mounting channel; (B) extruded aluminum body with Alzak parabolic reflector; (C) Chromalox, Iconel sheathed metal heating element; and (D) tongue and groove for lengthwise interlocking to form tunnel.

By R. F. Gengler

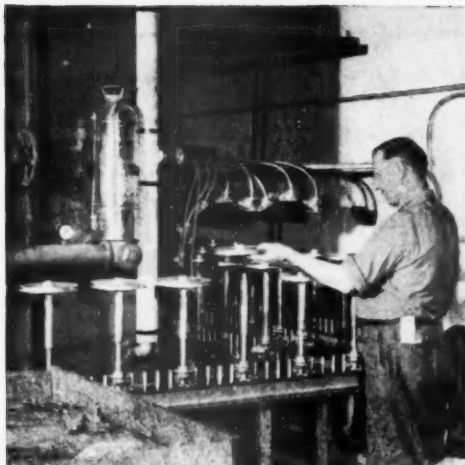
Chief Engineer,

Advance Tool & Die Casting Co.,

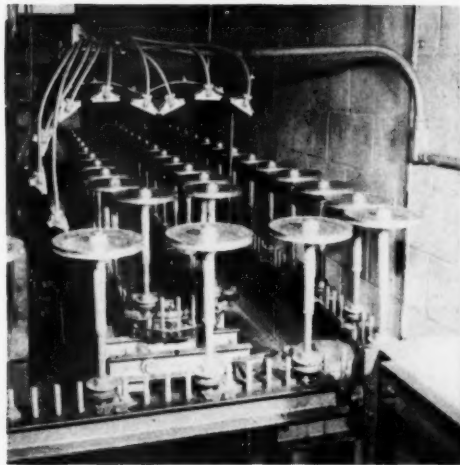
**P**RODUCTION has increased three-fold since the installation of an all-metal, "glass-less" infra-red heating "tunnel" over the spray booth conveyor at the Advance Tool and Die Casting Company plant in Milwaukee. Lacquered pulleys, automotive parts, power tool casings and similar items now come off the triple-pass conveyor ready for immediate packing and shipping.

All-metal Chromalox RAD-7361, 230-volt, 3,600-watt units were chosen





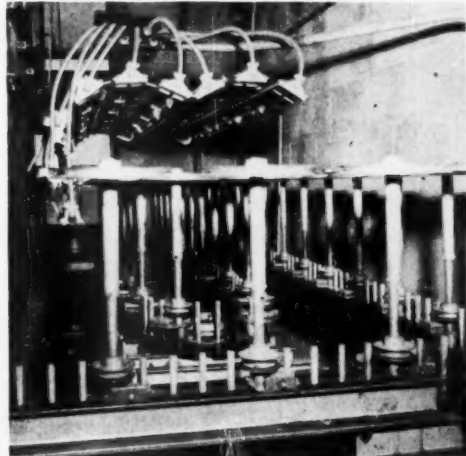
**OPERATOR REMOVES PULLEYS** from conveyor spindles after final pass under all-metal infra-red units.



**TUNNEL CONTOUR** is semi-heart shaped. Units are not interlocked and can be easily removed if desired.



**TURNING THE DIAL** on the percentage timer quickly adjusts heat on infra-red units for various sizes of parts and types of lacquer on specific production runs.



**HEATING UNITS FIT** in confined space between spray booth and building walls; are mounted to curved flat-iron brackets over two passes of chain conveyor.

for two basic reasons: 1) The confined area adjacent to the spray booth precluded use of standard glass infra-red lamps, while the 4-inch deep all-metal units permitted concentration of 32.4 kilowatts of heating over the conveyor; 2) the flexible heat control provided by a dial-operated percentage timer permitted "runs" of various sizes of parts without interruption.

Nine heating units (each 7 ft. 1 $\frac{1}{4}$  in. long) comprise the simple heating "tunnel" over the conveyor. They are mounted to three flat-iron supporting brackets; are connected to a balanced three-phase circuit; heat the parts on

the conveyor to approximately 350 to 400 degrees F. when necessary. For lacquer drying, the temperature is maintained at about 150° F.

The heat-control feature is an important asset to shop production where part sizes and lacquer types may vary with different runs. By simply turning a dial on the "infratrol" percentage timer, current flow to the heating units is controlled and the proper temperature for the job at hand can be quickly obtained. The timer operates on a 30-second cycle. Thus, as in the case of the pulleys illustrated, if the dial were set at 55 percent, the current would be

on for 16.5 seconds and off for 13.5 seconds. Because of the mass of the metal heating units there is a substantial "carryover" of heat even when the current is off and an even heat is maintained throughout the on and off cycling. Element temperature can be adjusted from four to 100 percent of rated values.

The combined compactness, ruggedness and low maintenance (no lamps to break and replace) and temperature adjustment features of the all-metal infra-red heating tunnel has solved what originally appeared to be a difficult drying problem.

Transmission Steel Tower, Average Steel Approx. 2 Ton, Installed with Concrete Footing, Per Ton.....\$1,000.00

Substation Structure, H Columns, Beams and Brace Installed with Concrete Footing, Per Ton.....\$625.00

Substation Fence Including Gates Installed, Per Foot.....\$3.75

Disconnect Switch, Hook Operated, 600A, Single Pole, Installed:

|             |             |             |
|-------------|-------------|-------------|
| 15,000 Volt | 23,000 Volt | 34,500 Volt |
| \$100.00    | \$120.00    | \$150.00    |

Air Break Switch, Group Operated, 600 Amp., 3 Pole Installed:

|             |             |             |
|-------------|-------------|-------------|
| 15,000 Volt | 23,000 Volt | 34,500 Volt |
| \$625.00    | \$750.00    | \$880.00    |

Lightning Arrestor, Thyrite-Station Type, Installed and Wired, Each:

|             |             |             |
|-------------|-------------|-------------|
| 15,000 Volt | 23,000 Volt | 34,500 Volt |
| \$375.00    | \$500.00    | \$625.00    |

Outdoor Oil Circ. Br'k'r, Installed with Concrete Mat and Connected:

| Type   | Voltage | Continuous | Interrupting | Estimate |
|--------|---------|------------|--------------|----------|
| FKO    | 7.2 KV  | 600 A      | 50 MVA       | \$2,500  |
| FLO    | 15 KV   | 600 A      | 100 MVA      | 3,750    |
| FLO    | 15 KV   | 600 A      | 250 MVA      | 5,000    |
| FLO    | 15 KV   | 1200 A     | 250 MVA      | 6,250    |
| FK-339 | 34.5 KV | 600 A      | 500 MVA      | 10,000   |
| FK-339 | 34.5 KV | 1200 A     | 1000 MVA     | 12,500   |
| FK-339 | 34.5 KV | 2000 A     | 2500 MVA     | 22,500   |

Potential Transformer Oil Filled Type E-236, Installed and Connected:

|                      |                        |
|----------------------|------------------------|
| 23,000 Volt—\$750.00 | 34,500 Volt—\$1,000.00 |
|----------------------|------------------------|

Current Transformer, Type JK-10, Installed, Each \$250.00

NOTE—Catalog numbers are illustrative only, the costs shown are for equipment of equivalent type and size.

# Quick Estimates 1.

By Wallace M. Adache\*

Adache & Case, Engineers  
Cleveland, Ohio

Data for preparing preliminary electrical construction costs before engineering or construction drawings are available.

THE "Quick Estimates" given were compiled for estimating preliminary electrical construction costs before final engineering or construction drawings are made.

All unit prices are installed costs to the client, including Contractor's normal overhead and profit, based on the average costs of labor, material, transportation, etc., in the Continental United States, with high quality of workmanship, material and equipment guaranteed by the Contractor or the Manufacturer. However, these prices do not include general contractor's overhead, profit, or engineering fees, which may vary from 5% to 10% of the net cost, depending on

the size and type of project. Any labor costs above national average, additional transportation costs and living costs for remote sites must be added to the net prices. These additive costs must be analyzed carefully to make the "Quick Estimate" accurate.

Most of the unit prices given are based on the larger type projects amounting to \$200,000 or more. When used on smaller projects or alteration work, sound engineering judgment should be used in setting of a contingency item to allow for additive costs, especially on outlets which require high price central control equipment such as fire alarms, signal systems, etc.

On all underground ducts and over-

head lines, unit prices are based on customer's short services installed by the contractor and do not include utility company's long distribution lines.

All values shown are based on national averages under current prices. Allowance should be made for price fluctuations and labor rates for the particular vicinity. Labor content used in estimates are at rate of \$2.50/hr.

Preliminary cost figures for transmission towers, substation work, switches, circuit breakers and metering transformers in place are covered in the following data tables.

\* Copyright by author and used by permission. Articles are selected abstracts from the manuscript of a forthcoming book on electrical construction design standards.

Plug In GROUNDED Portable Equipment Anywhere

# with "PLUG-IN" STRIP <sup>Type</sup> CF2-G

## A S-P-R-E-A-D

OF OUTLETS FOR CONVENIENCE PLUS  
SAFE GROUNDING FACILITIES  
BUILT IN!



*Dual-service receptacle. Insulator barriers removed for illustration.*

- Grounding receptacles permanently fixed to steel raceway.
- Installation provides continuous grounding circuit.
- Permits use of either grounded or ungrounded devices from any outlet.
- Will take either the new Series 5200 3-blade grounding plug or any standard parallel 2-blade plug.
- Meets the contemplated future provisions in the National Electrical Code covering grounded electrical systems.
- Quickest, easiest way of providing safety through grounding.
- Listed by Underwriters' Laboratories, Inc.

*EVERYTHING IN WIRING POINTS TO* →

**National Electric**  
PRODUCTS CORPORATION



### STEEL FOR PERMANENCE GROUNDED FOR SAFETY

National Electric Products Corporation  
1301 Chamber of Commerce Bldg.  
Pittsburgh 19, Pa.

Please send me your free folder: "Grounding 'Plug-In' Strip."

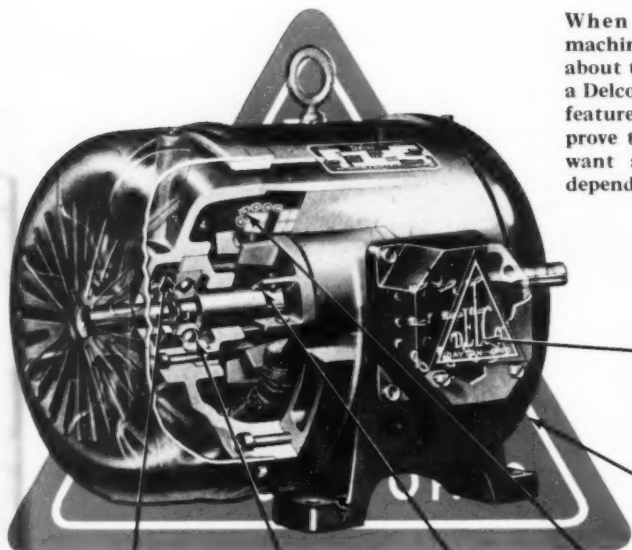
Name

Company

Address

# Here's the "INSIDE STORY" on DELCO MOTORS

When you invest in new production machinery, it pays to be just as particular about the motor that drives it. Look inside a Delco Motor. You'll see extra engineering features, extra care in construction, that prove to you a Delco is built the way you want a motor built. Specify Delco for dependable power day in, day out.



**WATER-TIGHT CONDUIT BOX**  
Protects against drip, splash



**CORROSIVE-RESISTANT CAST IRON FRAME**  
More solid, more rugged



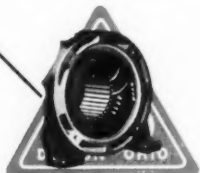
**POSITIONED BEARINGS**  
Maintain shaft alignment



**POSITIVE LUBRICATION**  
Lengthens bearing life



**DYNAMICALLY-BALANCED ROTOR AND SHAFT ASSEMBLY**  
Reduces vibration, wear



**DELCOTE COIL INSULATION**  
Over and above NEMA specifications

**"DELCO PREFERRED"**  
—because Delco Delivers

Open and enclosed motors for most industrial applications in sizes up to 100 horsepower for standard foot mountings. NEMA C&D flange-mounted motors available in sizes through 30 horsepower. Get in touch with Delco Products, Dayton, Ohio . . . or any sales office listed below.



## DELCO MOTORS

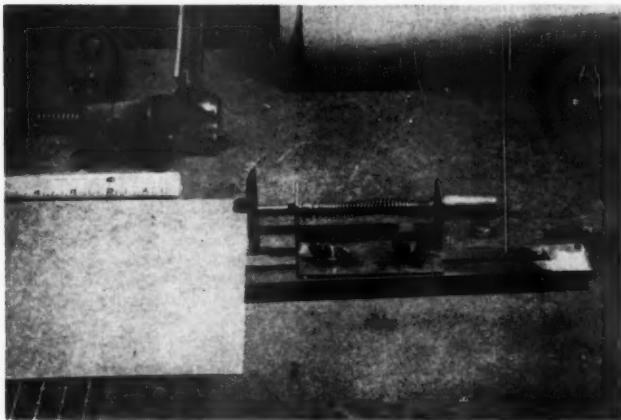
### DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

**SALES OFFICES:** Chicago • Cincinnati • Cleveland • Dallas • Detroit • Hartford • Philadelphia • St. Louis  
ALSO AVAILABLE THROUGH UNITED MOTORS SERVICE BRANCHES

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JANUARY, 1951

# Motor Shops



**ADJUSTABLE PAPER GUIDE** for insulation cutting board has thumbscrew mounting for basic setting plus threaded collar for fine adjustment. Coil spring feature prevents buckling of cut insulation strips.

## Paper Guide for Insulation Cutter

Co-partners T. A. Heermans and Edgar Foote of the F & H Electric Motor Company, Dallas, Texas, have inventive type of minds and have devised numerous gadgets to simplify the various chores associated with electric motor repairing. One of these devices is a simple cutting board attachment that speeds the cutting of slot insulation and separators.

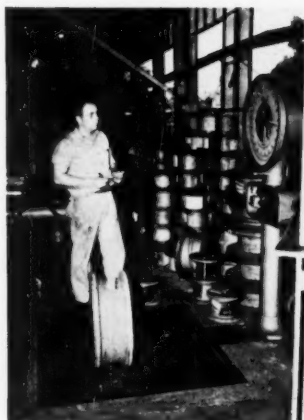
The paper guide is really a "stop" which can be set for the desired width of insulation. Once set, insulating strips of that specific width can be cut in rapid order. Base of the unit is a 15-inch length of 1½-in. by ¼-in. flat steel mounted to the bottom of the cutting board and extending 11 inches beyond the cutting blade. A 10½-inch slot (¼-inch wide) provides a sliding adjustment for the paper guide assembly.

Supporting the guide bar is a broad U-shaped bracket mounted to the base with thumb screws which slide along the slot. The stop bar is a flat piece of steel, tapered at the top, with a ¼-inch bolt extension threaded at one end and a smaller bar extension which keeps it in vertical position. The threaded bolt passes through both uprights of the bracket; has a coil spring attachment between the uprights and a threaded collar with set screw at the end. The positioning bar passes

through only one of the bracket uprights.

Initial adjustment of the paper stop is made by means of the thumb screws. Fine adjustment is made with the threaded collar and locked by the set screw. The coil spring keeps the stop in the desired position and permits it to back up slightly as the thick portion of the cutting blade passes through the insulation. This keeps the insulation from buckling and shifting when the cut is made.

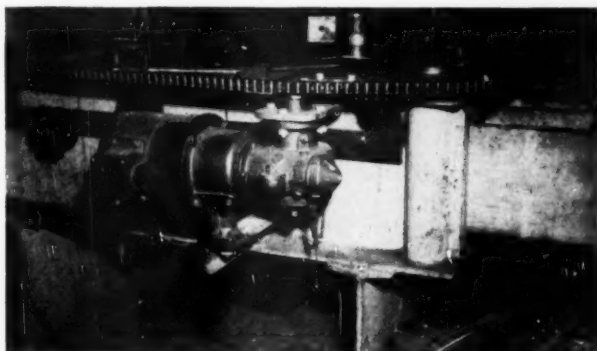
F & H mechanics find the attachment to be accurate and a substantial time-saver.



**FLUSH PLATFORM SCALE** in wire stock room at Dowzer Electric Machinery Works, Inc., Mt. Vernon, Ill., indicates weight of reels of magnet wire before and after being used on transformer winding lathes. Consumption is recorded in pounds. Unit has a 2,250-pound capacity.

## Gearhead Motor Raises Testing Platform

When motors are repaired in the shop of the Marine Electric Company in Portland, Oregon, they are tested by means of a dynamometer before being returned to the customer. In testing, motors are placed on a steel platform which is raised or lowered until the shaft of the motor being tested is in exact line with the dynamometer coup-



**GEARHEAD MOTOR** activates four jacks that raise motor-holding platform into desired position for dynamometer testing in the shop of the Marine Electric Company, Portland, Oregon.



# 3-Speed Milwaukee 1/2" Drill Cuts Cost of Electrical Work

Exclusive Milwaukee HOLE-SHOOTER combines straight and right-angle drilling . . . wonder-tool for close quarters

Built for use by electrical contractors and plant maintenance electricians, this Milwaukee 1/2" HOLE-SHOOTER — America's only 3-speed Right-Angle Drill — has demonstrated its unmatched time-saving performance on thousands of jobs. Most powerful drill built for its size and 9-lb. weight. Ball and roller-bearing equipped for extra-long service life.

You'll be amazed at its versatility — unit-built for quick change to suitable speeds for drilling in wood, metal, masonry, concrete, tile. Uses wood bits up to 3" . . . also 1/2" carbide-tipped drills.



Head swivels full 360°. Locks in any position.  
S-412 Drill with "2-speed Right-Angle Drive"..... \$69.00

For straight drilling, S-412 1/2" HOLE-SHOOTER (above) has a chuck speed of 450 R.P.M. With the 2-speed "Right-Angle Drive" attachment, speeds are 300 R.P.M. or 675 R.P.M.

Other bits available also — See assortment at left. We can supply you with any size wood-boring bits up to 3". Write us.

**Complete S-412 Tri-Speed Kit Contains**

- 1 — S-412 1/2" HOLE-SHOOTER, Jacobs geared chuck.
- 2 — \*Two-speed "Right-Angle Drive" attachment.
- 3 — 3 special bits — 3/4", 1 1/8", 2 1/4".
- 4 — Special wrench.

\*Pat. Pending

**Complete S-412**

**KIT...\$87.00**

Call your distributor today, or write us and give his name.

**MILWAUKEE ELECTRIC TOOL CORP.**

Makers of portable electric drills, saws, hammers, grinders, sanders, and accessories.

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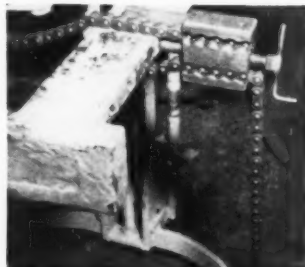


ling. This platform is activated by four corner worm jacks. The jacks move up or down through the rotation of internally-threaded and externally-sprocketed collars. These collars are rotated easily and simultaneously by means of a chain passing around all four jack collars as well as around the gear of a gearhead motor. The testing platform is liberally drilled with holes for taking motor-holding bolts.

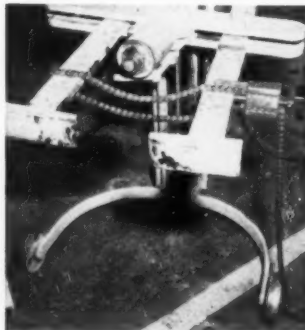
## Chain Grip Holds Puller Arms

Any shop mechanic who has operated a hydraulic pulley puller knows of the tendency of the puller arms to open or spread under extreme pressure. Some motor shops use adjustable flat-iron bar cross-pieces to keep the arms in position. However, there still is a possibility of shearing the bolts which hold the braces in place.

Shop superintendent E. R. Pearson of the Koontz-Wagner Electric Company, South Bend, Indiana, has solved this problem by devising a parallel-link chain attachment to keep puller



**CHAIN GRIP** slides over hydraulic puller arms; is held in position by specially designed locking block.



**STEEL BLOCK** seats chain links; has parallel arms which slide over puller arm; is held in notched position by heavy set screw which also adjusts final chain tension.

You can *Save* space and *Reduce*  
inventories with TRIANGLE'S  
"DUAL-RATED"

This **ONE WIRE** will cover your

**RH and RW WIRE**  
requirements

RH—RW?—forget them!  
Triangle's "Dual-Rated",  
Type RHW  
meets the physical  
and electrical requirements  
of each one of those types.  
Think of the money  
you can save  
on reduced inventories.  
Think of the space you save.  
Think of the confusion  
and headaches you avoid.

**WHERE IT'S HOT—**

"Dual-Rated" is  
Underwriters' Lab-  
oratories approved  
as Type RH at 75°C.,  
dry locations...or

**WHERE IT'S WET—**

"Dual-Rated" is  
Underwriters' Lab-  
oratories approved  
as Type RW at 60°C.,  
moist locations.



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**TRIANGLE CONDUIT & CABLE CO., INC.**

NEW BRUNSWICK, NEW JERSEY

"Glazon" Building Wire • Bare Wire • Armored Cable • "Glazon" Non-Metallic  
Sheathed Cable • Service Entrance, Service Drop, Varnished Cambric Braided or  
Leaded, Triprene Trench, Power and Parkway Cables • Rigid Conduit Hot Dipped  
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*For Complete  
Flexibility  
and Ease of  
Installation*

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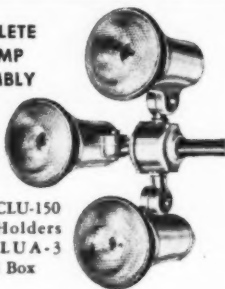


**CLUSTER  
SPLICE  
BOX**

CLU-5

6 tapped holes, 2 plugged. Built-up center post keeps screw from wires. Self-centering hole in post for easy screw insertion.

**COMPLETE  
3-LAMP  
ASSEMBLY**



3 No. CLU-150  
Lamp Holders  
with CLUA-3  
Terminal Box



**2 INCH  
POLE  
FITTER**

CLUA-21

Slip fit adapter for 2" pipe, with set screw and 1/2" close nipple.

**CLUSTER  
TERMINAL  
BOX**

For upright or horizontal position—one, two, or three lamps. Can be used on top of CLU-5 splice box for 7-lamp combination.



CLUA-3

arms parallel. He uses seven-foot length of chain, encircles the puller arms and locks it in a specially designed steel block.

The locking device is made from a 3-in. by 3-in. by 1 1/2-in. steel block. Two parallel rows of holes were drilled and slots milled in the block to fit the contours of 2 1/2 chain links. Once the chain is seated in the block, the links would have to break or the block split before the chain would slip.

Two 1/2-in. square steel "arms", each six inches long, are welded to one side of the steel block. These slide over the heavy puller arm and hold the block in position. A heavy set-screw, passing through the center of the block, seats itself in notches drilled in the side of the puller arms at two inch intervals. This prevents slippage of the block as the arms tend to open; also provides final adjustment of chain tension before hydraulic ram is operated.

The chain grip has proved its worth on all pulling jobs, especially the tough ones where extreme ram pressures are developed.

## Repair Time Cut in Half

Time-saving results were obtained through power tools at the Apparatus Service Shop of General Electric Company in Philadelphia. Nut removal and replacement time was cut in half by using an Ingersoll-Rand electric Impactool.

This tool cannot be harmed by overloading because of the impact principle involved. It automatically delivers thousands of rotary impacts to the work whenever the spindle meets resistance.

Though rated at 3/4 inches capacity, the 4U size tool is used to handle nuts



**IMPACT TOOL** removes 1/2 inch cap screws from the end shield of a single phase, vertical pump motor.

## "FLOATING SOCKET" LAMP HOLDER

Pat. applied for



CLD-150

Cutaway view of 150 watt lampholder with floating socket that compensates for variations in size and shape of lamp. Tight seal, positive electrical contact.

## CLUSTER SPICE BOX FOR 7 LAMPS



CLU-7

Body with 7 drilled holes, 5 in top and 2 plugged in back.

WRITE FOR INFORMATION AND PRICES

*The M. E. Austin Company*  
NORTHBROOK, ILLINOIS

NO CRACKING  
OF VARNISH!

*New!*

NO BREAKING  
OF LEADS!

**IRVINGTON #123**

insulating

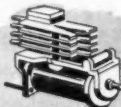
**VARNISH**

*Stays flexible after baking!*

UNSURPASSED FOR



TRANSFORMERS



RELAYS



COILS OF ALL TYPES

Here's a new insulating varnish that's packed with performance characteristics that really pay off! For here's a varnish that soaks deep into coil windings...bakes throughout to form a tightly bonded mass...yet *stays flexible on leads!*

Yes, Irvington's new #123 varnish does just that — lets you twist and bend coil leads after baking, without danger of cracking varnish, without risk of breaking tiny wires! Cuts spoilage, simplifies assembly, helps assure uniformly high quality for your product!

You'll find #123 varnish ideal for transformer coils, solenoids, all windings where leads must remain flexible after varnishing and baking. For full details, test results, samples... write today.

*Look to Irvington*  
for Insulation Leadership



**IRVINGTON**

VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

# Specify



## FOR YOUR WIRING REQUIREMENTS

From the simplest receptacle to heavy duty, Type C, T Rated switches... specify Leviton. Leviton uniformity, performance, and endurance are worthy of your confidence.

The skill and precision in design and manufacture that go into every Leviton device is part of an unending effort to provide the finest devices that money can buy... and to surpass even the highest standards of accepted performance.

### The "5000 Series" Combination Devices

**No. 5211** Single Pole Switch rated 10A-125V-T, 5A-250V Outlet Receptacle, rated 15A-125V, 10A-250V.

This heavy-duty switch and double contact receptacle are entirely enclosed in a heavy, sectioned, dust-proof, Bakelite housing. Large-head terminal screws, located for side wiring, will hold No. 10 conductors. The + Line side is common to both switch and receptacle, which operate independently. Made in Brown and Ivory.

**No. 5213** Single Pole Switch rated 10A-125V-T, 5A-250V. Pilot Light, rated 75W-125V. Same construction as No. 5211. Nickel plated hood removable by slight manual pressure.

**No. 5212** Duplex S.P. Switches rated 10A-125V-T, 5A-250V. Same construction as No. 5211.

**No. 5214** Same as No. 5212 with individual terminals for wiring on separate circuits.

Listed by Underwriters Laboratories and C.S.A. Meets REA and Federal Specifications.

Fits all standard and Leviton duplex wall plates.

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THE LEVITON LINE**

## LEVITON MANUFACTURING COMPANY

MAIN OFFICE and FACTORY: BROOKLYN 22, N. Y.

WAREHOUSES: CHICAGO and LOS ANGELES



5211



5213



5212  
5214



**THOMAS C. FOWLER** is no front-office pilot whose sole concerns are those of a paper and phone nature. Rather, he is a rolled-sleeve, practical-experienced boss, as frequently found in the shop of the Reserve Electric Company in Cleveland as he is at a drafting table or at his desk with a slide rule, pencil or price sheet.

and bolts ranging from  $\frac{1}{4}$  to  $\frac{3}{4}$  inches. A larger size is available which is rated at  $\frac{1}{2}$  inches bolt size.

Maintenance costs are greatly reduced since the motor cannot be burned out. Even if the spindle is completely stalled, the motor continues to run. This eliminates the usual major failure of conventional electric tools.

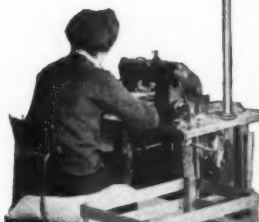
One unique feature is that the torque delivered to the work is not transmitted back to the operator. The tool weighs 6 pounds, 8 ounces.

## Steam Coils For Fireproof Oven

The necessity for a fireproof baking oven in the motor shop of the Cascade Machinery Company, Seattle, Washington, led to the development of a unit heated by steam coils. Steam is furnished by a boiler equipped with three 10-kw immersion heaters. Temperature of the oven depends upon steam pressure which, in turn, depends upon the number of immersion heaters in use and the length of their operating cycles. Under normal circumstances only two heaters are required to keep steam at 65 pounds pressure and oven temperatures around 275 degrees. Heaters are controlled by a pressurestat regulator and the danger of low water in the boiler is eliminated through the installation of an automatic water feed valve.

The use of steam as a heating agent





**OPERATORS  
RELOCATED**  
*any time!*

A simple count of the number of outlets planned for a room will tell you whether Feedrail would save time and money in the long run. A dozen motorized bench tools will justify a Feedrail line. A group of sewing machines that are frequently re-located makes Feedrail layout a practical necessity. And, if you have moving test lines, lights or motors or cranes and hoists, Feedrail becomes a must.

The reasons are simple. Feedrail is a totally enclosed, overhead distribution system with removable trolleys. Each electrical device may be fused, or protected by circuit breakers. No wires on the floor—Everlok connectors can't pull out accidentally—and maintenance and interruptions to production are practically eliminated.

### *Contractors*

everywhere are suggesting Feedrail layouts because one application spreads quickly to the entire plant. For prestige and profit ask the Feedrail representative to design a layout for your next important wiring jobs.

33

**ELECTRIC  
FEEDRAIL**

**FEEDRAIL CORPORATION**

*Subsidiary of Russell & Stoll Company, Inc.*

**125 BARCLAY STREET • NEW YORK 7, N. Y.**

SAVE HOURS ON

CONDUIT AND PIPE

INSTALLATIONS

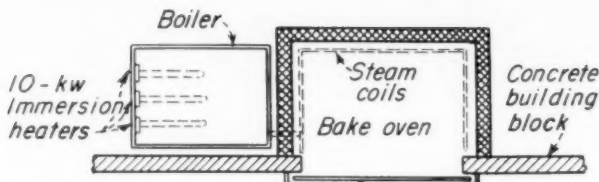


### ...with a GREENLEE PIPE BENDER

Cut costs, speed your jobs this efficient, easy, economical way. Make "on the job" bends in pipe and rigid conduit up to 5", thin-wall conduit and tubing with a GREENLEE Hydraulic Bender. One man operated for fast, accurate, uniform bending. Simple to operate, easy to set up and shift from job to job. Not only saves labor, but eliminates cost of many manufactured bends and fittings. Often pays for itself on first few jobs. Write today for free folder No. E-201.



Other GREENLEE timesaving tools for industry: Hand Benders for tubing • Hydraulic Pipe Pushers • Knockout Tools • Auger Bits and Drills • Spiral Screw Drivers • Chisels and Gauges • And many others. Greenlee Tool Co., 1741 Columbia Ave., Rockford, Ill.



Counterweighted, insulated, slide-up metal door

**ELECTRIC IMMERSION HEATERS** provide steam for maintaining oven temperature at 275 degrees. By eliminating gas-fired and electric strip heating units, possibility of fires resulting from sparks or flames igniting volatile gasses are absent.

was necessitated due to the amount of emergency motor repair work required just prior to and during the fish-canning season in the northwest area. For, due to the number of rush rewind jobs hitting the shop at the same time, it was necessary to speed up the rewind-dip-bake cycle as much as possible. One solution was to use a special insulating varnish having a thinner that was more volatile than that formerly used. The volatile thinner, however, introduced the possibility of an oven fire starting in the event of a spark or flame igniting the resulting oven gasses. This possibility eliminated gas-fired heating units, and electric strip heaters were also bypassed due to the possibility of a short circuit or broken wire in the units causing a spark.

While the steam boiler is heated by electric immersion heaters, there is no danger from the electric use because the oven and boiler are separated by a thick insulated wall. In this way, access to the oven is from the shop, but access to the boiler is from a separate room behind the oven. The only break in the insulating wall is for the passage of steam coils from boiler into oven.

The front of the oven, flush with the shop wall, is closed by a counterweighted, insulated, slide-up metal door. Air circulation is insured by the installation of lower-side supply ducts and a roof-housed exhaust system.

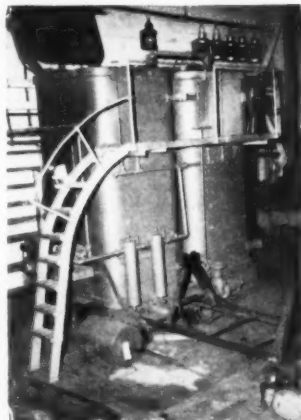
The necessity for using insulating varnishes with volatile thinners is present for only a short period each year. However, operating economies, minimum maintenance and the plus value of constant safety are year-round benefits derived by Cascade.

### Vacuum Tank For Impregnation

The Marine Electric Company of Portland, Oregon, has speeded up the process of impregnating wound motor units and now devotes 10 minutes to a job that formerly took 1½ hours. The solution came with the installation of two vacuum tanks capable of sus-

taining 28 pounds of vacuum. The motor to be insulated is raised by an overhead crane and lowered into one of the tanks. A vacuum is then created and, with the motor windings in this condition, insulating varnish is admitted into the tank. Varnish is pulled into the coils, thoroughly impregnating the windings. Before the tanks were used, coils were dipped in the normal manner, but, although immersion lasted 1½ hours, subsequent examination proved that impregnation was not always thorough. The use of the vacuum, therefore, does the job better and nearly 10 times faster.

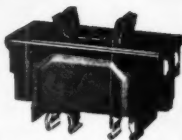
The two vacuum tanks are double-shell steam-jacketed sterilizing tanks, formerly used in a laundry. The inside dimensions are 4 by 4 by 10 feet. A ship's ladder permits the operator to mount to the top of the tanks. He controls the vacuum and varnish intake valves by means of a long-stemmed hand wheel.



**LARGE CAPACITY TANKS** capable of maintaining a 28-pound vacuum are used in the shop of the Marine Electric Company of Portland to speed the process of impregnating windings with insulating varnish. Tanks will eventually be lowered into a pit and surrounded with subway grating for safety and convenience.



Cutaway showing circular bus bar onto which breaker units are plugged. Twist-outs close openings provided for future use.



### *Coilless* **THERMAL-MAGNETIC BREAKER UNITS GIVE 2-WAY PROTECTION**

Thermal Element responds to heating effects of both load current and surrounding atmosphere. Total temperature is limited to a safe value.

Magnetic Element responds instantly to heavy overloads or shorts.

**Both Elements are needed  
for complete protection!**

# New

## "PLUG-IN"

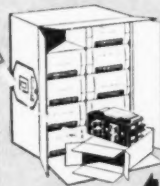
### MULTI-BREAKER NMO PANELETTE

"OFF-THE-SHELF" companion to the popular NMO Panelboard, the low cost Panelette meets most A.C. lighting and appliance circuit SWITCHING and PROTECTION requirements. Standardized components required by authorized Square D Distributors stocked everywhere.

**Construction.** Box only 12" W x 4½" D, yet easy to wire... door with locks... lugs only from 4 to 28 circuits or circuit breaker mains from 4 to 20 circuits... 1ø, 3 wire or 3ø, 4 wire... flush or surface... 15, 20, 30, 40 or 50 Ampere "Plug-In" units interchangeable with NMO Panelboard and MO 12 or MO 20 load centers.

### START WITH 4... ADD MORE

Small Stock of Standardized Components takes care of most job requirements

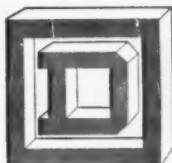


Box, bus structure and one 4-pole breaker unit are packed in carton designed to receive additional breaker units and trim when selected.



Separately packed "plug-in" breaker units are either 2 or 4 pole types. Handle ties convert adjacent poles of like rating into double pole circuits.

Separate flush or surface trims have twist-outs closing unused openings.



Write for Bulletin 1600, Square D Company, 6060 Rivard Street, Detroit 11, Michigan

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## PYLE-NATIONAL INDUSTRIAL LIGHTING FIXTURES



### EXPLOSION-PROOF

PYLE-NATIONAL LE SERIES (Class I, Groups C and D)

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.

*for safety*

IN HAZARDOUS LOCATIONS



### DUST-TIGHT

PYLE-NATIONAL DE SERIES: (Class II, Group E, F, G and Class III)

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

### FLEXIBLE SUPPORTS

PYLE-NATIONAL FO SERIES: (Class I, Group D; Class II, Groups E, F and G and Class III)

Pyle-O-Flex supports are for use with pendant type, explosion-proof and dust-tight lighting fixtures to comply with NEC which limits rigid stems to 12" in length.

Pyle-O-Flex is made to resist internal explosions and provides a good electrical joint without bonded jumpers.



Pyle-National also manufactures a complete line of explosion-proof and dust-tight supporting PYLETS for lighting fixture mounting, in addition to an extensive line of the most commonly used types of conduit fittings, switches and circuit breakers for hazardous locations. Consult the new PYLET Catalog

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# Industrial Electrification

## Tests For Rotating Electrical Equipment

An evaluation of available test procedures for rotating electrical equipment; also factors to consider when interpreting test results.

By Loren Jones  
Design Engineer  
National Electric Coil Co.  
Columbus, Ohio

**O**VER the last 30 or 40 years, various methods have been developed to test insulation in electrical rotating equipment. Each has its particular application, but as yet there is no one single, reliable, non-destructive test which will disclose the overall condition of both the major (ground) and minor (turn) insulation. Rather, a combination of test methods must be used depending upon whether the equipment is new or already in service.

When testing new or rewound equipment, it is not only necessary to test the insulation but also to check for proper coil grouping, pole polarity sequence, and phase connections. While new equipment can be tested satisfactorily, the situation is quite different for old equipment. This deficiency in our test methods was more than emphasized at the beginning of the War by the number of failures which occurred when stand-by equipment was put into continuous service.

Available test methods fall in one of two categories: DC resistance test and high-voltage proof test. Because experimental results show no correlation between insulation resistance and dielectric strength of winding insulation, a combination of the two different types of testing is employed. The criterion for good insulation requires both high resistance and high dielectric strength.

DC resistance tests find their greatest application in the periodic testing of equipment already in service. However, the result must be interpreted intelligently since moisture, temperature, class of insulation, general condition of the winding, and applied test voltage all have a prominent effect upon the resistance. Equally important, a dc resistance test constitutes only a ground insulation test and gives little information about the condition of the turn insulation except that it can probably be assumed that the ground and turn insulation will deteriorate at about the same rate. Thus, if the ground in-

sulation tests satisfactorily, the turn insulation should be equally satisfactory. However, heat is generated in the copper and dissipated through the insulation into the surrounding medium. A temperature gradient is always present in which the temperature of the turn insulation is higher than the ground insulation. Consequently, the turn insulation will have a faster rate of deterioration than the ground insulation. Air pockets and poor coil design will further aggravate the situation.

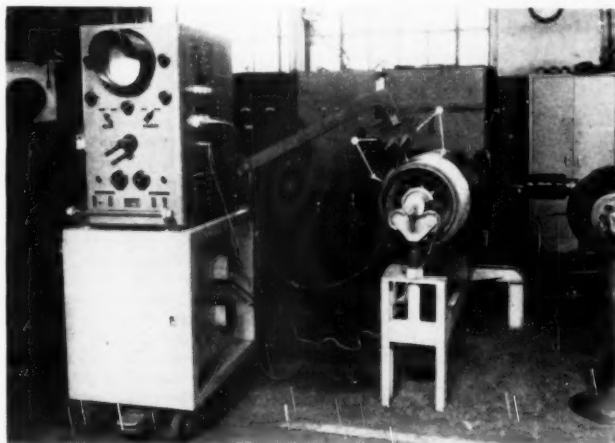
The most common type of dc testing is the *low voltage or Megger test*. This is practically the backbone of all testing procedures since it is easily taken and gives a quick approximation of insulation condition. New or old equipment should always be first Meg-

gered to insure at least a minimum safe resistance before subjecting the winding to a high voltage proof test.

### High Voltage DC Test

High voltage dc resistance testing is a more recent development and has proven very practical, especially in disclosing the condition of insulation in old equipment. The test takes advantage of the fact that the dc resistance of faulty insulation will decrease as the voltage stress is increased, or if the voltage stress is maintained.

Typical test voltages used are 3,000 volts dc for 2,200-volt equipment, and 8,000 volts dc for 6,600-volt equipment. Test equipment consists of a bank of series-connected batteries or a high voltage rectifier. The latter requires very good voltage regulation. Slight variation in the ac supply voltage, unless compensated for, will cause appreciable fluctuation in the dc test voltage. The accuracy of the test depends upon a constant dc voltage.



**WINDING COMPARISON** surge test set-up for high voltage testing of an armature. Traveling wave nature of test voltage through armature winding produces ground and turn insulation stresses simultaneously.





**"WOULD NOT SELL IT FOR  
TWICE THE PURCHASE PRICE"**

Says Walter G. Kolb, President,  
Kolb Electric, Washington, D. C.,  
of his first Up-Right Scaffold.

**ONLY**

**Mobile Aluminum Alloy  
"UP-RIGHT" SCAFFOLDS**

have

**BUILT-IN LEGS . . .  
INSTANTLY ADJUSTABLE**

for rapid leveling  
on uneven floors  
or on stairways.  
Eliminates the  
cost of tedious  
screw leveling.



**PLUS  
OTHER**

**EXCLUSIVE FEATURES**  
That save time & increase profits



**MOBILE TOWER  
SCAFFOLDS**  
in desired number  
of 6' or shorter  
section units.

1. Patented one-piece sections—no separate frames. Each section folds flat. No wrenches, wing nuts, bolts or loose parts.
2. Patented casters lock swivel and wheel as one.
3. Welded construction provides greater strength and safety.
4. One man assembly—each aluminum alloy section can be carried and assembled easily and safely by one man.

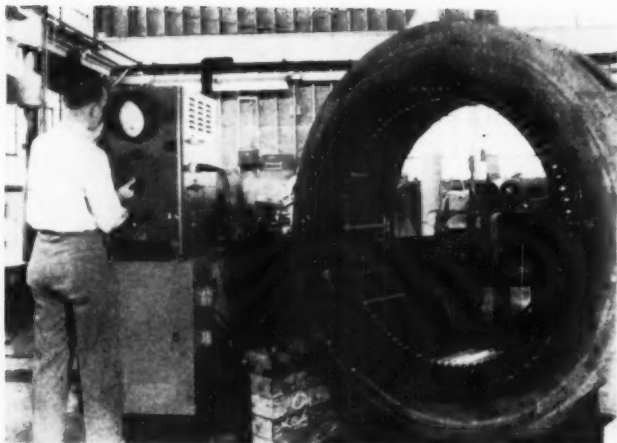
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Descriptive  
Circular**

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Factories: BERKELEY, CALIF., & TETERBORO, N. J.

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**HIGH VOLTAGE** proof testing of a three-phase Wye-connected stator using a winding comparison surge tester. Electrical characteristics of two phases are compared on oscillograph at instants when the ground and turn insulation are subjected to high dielectric stresses.

The dc test voltage is applied between winding and frame; is gradually increased to test value and usually maintained for a period of five minutes. Any erratic current increase indicates defective insulation. Dielectric absorption must be accounted for in interpreting the results.

High voltage proof tests are used mostly for testing new or rewound equipment to verify the condition of the major and minor insulation by its ability to withstand high voltage stresses. For many years this type of testing was limited to a power frequency potential applied to winding and frame. However, while adequate for checking the ground insulation, it gave no information about the equally important turn-to-turn or phase-to-phase insulation.

Some experimental work has been conducted on the possibility of using a high dc potential to obtain a ground test. This would permit the use of low capacity dc equipment for testing rotating electrical equipment, regardless of the size, as the capacitance effect of the windings would be eliminated except for the initial charging period. The problem when using dc voltage is in establishing a satisfactory ratio between the value of the dc and ac test voltage so that both would give equivalent ground tests.

Shorted turns and low resistance shorts can usually be located by a growler or by energizing the winding using about 20 percent of rated voltage and checking for balanced phase currents. High resistance shorts or weak insulation spots are more difficult to locate and require the use of a high frequency voltage applied across the

winding to secure sufficient turn-to-turn stressing to break down faulty insulation.

#### High Frequency Test

High frequency voltage test equipment usually takes the form of the early spark gap transmitter. The equipment consists simply of a power frequency step-up transformer that has both the capacitor shunted across the secondary side and the winding of the machine in series with an adjustable rotary air gap. In operation, the capacitor is charged to the breakdown voltage of the air gap. A damped oscillation discharge then occurs across the spark gap which results in a high frequency voltage that stresses the turn-to-turn insulation.

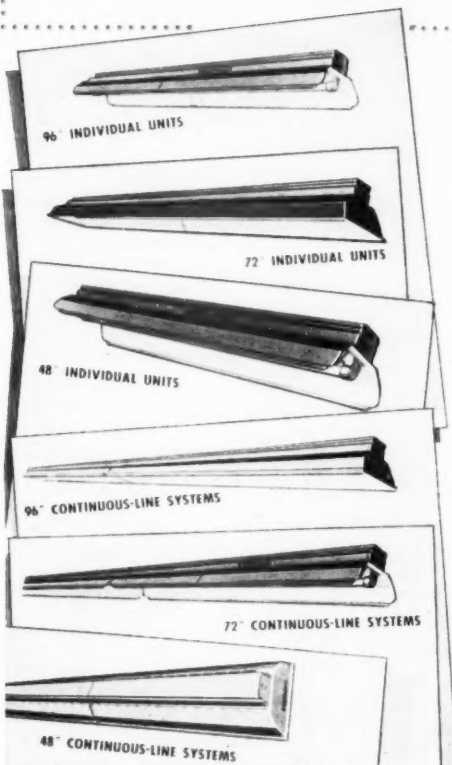
Defective turn insulation is detected by either burning the defective insulation or observing current variation in a tuned resonant circuit having a pick-up coil which can be moved around the surface of the core containing the winding under test. This type of equipment has been used for a number of years, although it is bulky and requires a rather elaborate set-up. The test voltage applied to the terminal of the machine is normally in excess of the ground test voltage and thus care must be taken that the machine is not grounded.

#### Surge Voltage Test

Recently a new type of high voltage proof testing equipment has been available. The equipment is especially adaptable for detecting and locating faulty insulation or improper connections in polyphase machines and armatures.



## NEW BENJAMIN "MAGNA-FLO" BULLETIN Available Now!



**Tells Why You Capitalize Fully  
on the EXTRA EFFICIENCY of the NEW  
T12 SLIMLINE LAMPS when you specify  
NEW BENJAMIN "MAGNA-FLO" SYSTEMS**

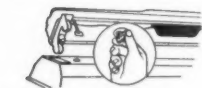
Bulletin MF brings you complete data on the 18 different types of Benjamin "Magna-Flo" Units for the 96", 72" and 48" T12 Slimline Lamps. It describes all the "Magna-Flo" advantages which make possible *higher lighting levels* at lower cost with sustained efficiency.

Of special interest are illustrations, descriptions and other data on the many Benjamin "Magna-Flo" features which enable you to capitalize fully on the extra-efficiency of the new, instant-start, single-pin T12 Slimline Lamps. Among the features described are:

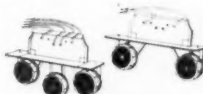
- ① The right unit for every installation requirement. Wide variety of types and sizes! Individual units or continuous lines... closed or open-end... apertures for brightness control.
- ② Speedier lamp maintenance with new single-pin "SPRINGLOX" Lampholders! Lamp pin contacts cannot get out of order... faster lamping and re-lamping... eliminates danger of lamps dropping out... exclusive with Benjamin!
- ③ High light reflection factor of Benjamin "Life-Time" Porcelain Enamel Reflectors (82% minimum).

... and of course, as you would expect of any Benjamin Fluorescent Lighting Unit, you get Certified Ballasts for minimum service interruptions; easy-to-clean "Life-Time" Porcelain Enamel Reflectors; RLM-approved open-end reflector contour; famous "built-like-a-battleship" construction for greater structural strength and elimination of channel sag; and all the other plus-values which you naturally associate with Benjamin Quality.

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Patented construction greatly simplifies and speeds up lamp insertion and removal.

"Magna-Flo" Units are available for either two or three 48", 72" or 96" T12 Slimline Lamps  
Benjamin Lighting Equipment Is Sold Exclusively through Electrical Distributors



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"Dow Corning Silicone Insulation enables us to solve nearly every conceivable motor problem our customers can possibly encounter."

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WHITTAKER ELECTRIC COMPANY  
Muskegon, Michigan

### Be The Recognized Authority In Your Area.

In business as in battle, he wins who "gits thar fustest with the mostest". And more and more motor users recognize Dow Corning Silicone (Class H) Insulation as the "mostest" money can buy. By giving longer life, high overload protection and extraordinary resistance to heat and moisture, this class of insulation enables you to solve even the most difficult of your customers' motor problems.

But that's not all. The very fact that you can offer a solution sets you up as an authority. Your shop gains first consideration, even for ordinary, run-of-the-mill jobs. You earn a better profit margin on the Class H business; you gain prestige and win more customers and your total volume of business increases. That's why we say: Call our nearest branch office today or write to Dept. G-1.

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The design of the machine is such as to simulate controlled surge voltages in two phases of a Wye-connected machine and to provide a visual comparison of the electrical characteristics of the two phases by means of a cathode-ray tube oscillograph. A selector switch allows quick interchanging of the leads of the three-phase machine so that the three phases can quickly be compared with each other.

The surge voltage is produced by a condenser which is discharged through a synchronous reversing switch into the winding 60 times a second. The synchronous switch changes the direction of travel of each succeeding surge through the winding. Because the capacitance and inductance of the winding are well distributed, the electrical phenomenon is that of the traveling wave mechanism in which the wave propagation is relatively slow. These characteristics allow a steep-front voltage wave to travel through the winding which results in high turn-to-turn stressing along with phase and ground stressing. Because of attenuation of the voltage wave and some standing wave effects, the ground and turn insulation stressing are not constant, but vary throughout the winding. These effects give maximum dielectric stressing in coils and phase groups electrically close to the winding terminals, where actually the ground insulation stressing is in excess of the applied value of the test voltage. Since the ground insulation stressing varies throughout the windings, it does not give a ground test equivalent to the standard AIEEE ground test, but stresses the major and minor insulation of the winding in a manner similar to that which would be encountered in service due to lightning and switching voltage transients.

In operation, the surge voltage is applied in alternate direction to two phases of a three-phase, Wye-connected motor or generator. The vertical plates of a cathode-ray tube oscillograph are connected through a capacitor divider to the other phase which acts as a center tap at the neutral point. The oscillograph then shows a voltage wave which is the resultant of the voltage at the neutral and whatever is induced in the phase acting as the center tap. If the two phases being compared are electrically identical, the oscillograph of the voltage appearing at the neutral will be the same for either direction of surge voltage travel and a single standing wave will be observed. However, if a defective ground or turn insulation or improper coil connection exists in one of the two phases, the voltage appearing at the neutral will no longer be the same for the two directions and two dissimilar waves will appear.

## How to keep a good man "thread- happy!"



### Team him up with the new "TOM THUMB" portable threader!

No question about it—the new No. 582 "TOM THUMB" is a pleasure to operate. The high quality of threads and the speed of getting them with almost no physical effort on this super-modern machine keeps a good mechanic happy. What's more, the increased efficiency and low cost of pipe threading makes a profitable investment for YOU!

It takes illustrated BULLETIN NO. 582 (copy on request) to tell you WHY this new "TOM THUMB" is the "king of the portables". But note these few samples:

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Better write for that BULLETIN NO. 582 right now. The new No. 582 is a top-notch business investment!

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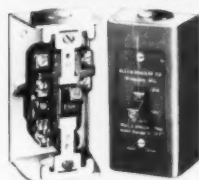
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Here are starters, contactors, relays, and pilot controls for all types of motorized machines. These devices... and many more... are listed in the latest Allen-Bradley Handy Catalog. Please send for it.



**FRACTIONAL HP STARTER**  
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*Bulletin 609*—For installations exposed to moisture conditions.

**MANUAL STARTER**  
Reduced Voltage Type



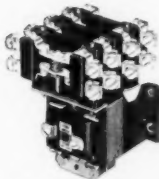
*Bulletin 646*—Transformer starter for sq. cage motors.

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*Bulletin 700 BX*—Changeable from N.O. to N.C. contacts.

**SOLENOID CONTACTOR**  
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*Bulletin 702*—Contactors available up to 900 amperes.

**AUTOMATIC STARTER**  
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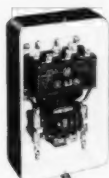
*Bulletin 746*—Transformer starter for sq. cage motors.

**SOLENOID STARTER**  
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*Bulletin 709*—Most popular across-the-line motor starter.

**SOLENOID STARTER**  
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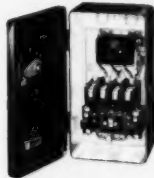
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**SOLENOID STARTER**  
Size 7 • 300-600 hp



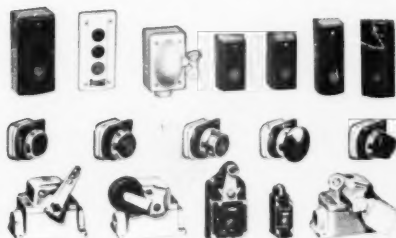
*Bulletin 709*—The newest addition to A-B solenoid line.

**COMBINATION STARTER**  
With Disconnect Switch



*Bulletin 712*—Saves space and makes neater installations.

STANDARD, HEAVY DUTY, AND OILTIGHT PUSH BUTTONS • LIMIT SWITCHES



See Next Page

**ALLEN-BRADLEY**  
QUALITY  
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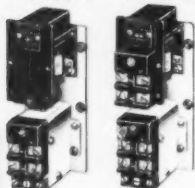
1210 S. SECOND STREET, MILWAUKEE 4, WIS.

# SPECIAL PANELS • CONTROL CENTERS • ACCESSORIES

Allen-Bradley contactors, relays, and timers are widely preferred as components of special control panels. Their long, trouble-free life accounts for their universal popularity with machinery builders.

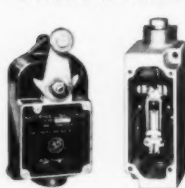
High production machines need automatic controls that are dependable and maintenance free. Allen-Bradley controls... are good for millions of precision operations... are "tops" for performance and reliability.

## PNEUMATIC TIMERS From 1/4 to 180 Seconds



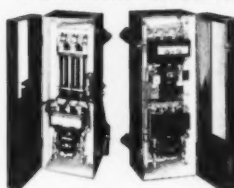
Bulletin 849—Dependable timer for a-c & d-c circuits.

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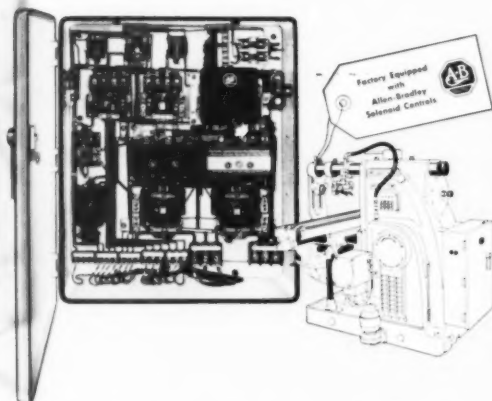
Bulletin 640—Manual type.  
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## D-C MAGNETIC STARTERS For General Applications



Bulletin 265 with automatic time limit motor acceleration.

## SPECIAL PANELS FOR SEQUENCE CONTROL Any Size • Any Sequence • Any Machine

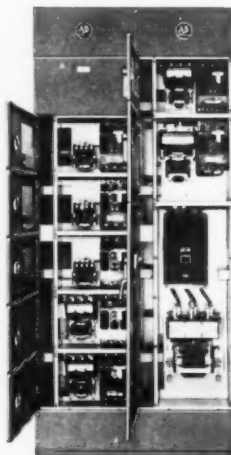


Special Panels—Allen-Bradley special control panels can be designed for any sequence of automatic operation of motor driven machines. Let us handle your control problems for you.

## MULTI-UNIT CONTROL CENTERS For Centralized Operation



Bulletin 798 Control Center—All controls are centralized in a neat, compact installation.



Bulletin 798—With Doors Open—Shows arrangement of various multi-unit controls.



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QUALITY  
**MOTOR CONTROL**

1316 S. SECOND STREET, MILWAUKEE 4, WIS.

## STANDARD ENCLOSURES For Every Service



See Preceding Page

151-MR



## CONTRACT MAINTENANCE OF LIGHTING SYSTEMS

[FROM PAGE 45]

the telephone classified list of all drug stores in Washington was used, and resulted in an excellent list of prospects. Most of these prospects were subsequently signed up on contracts through personal call follow-up. A classified advertisement is carried in the classified section of the telephone directory, which also accounts for several leads per year.

A major factor in selling contracts is the benefits which a maintenance contract offers the customer. These benefits are listed by Stern as follows:

1. Saves the customer money on his lighting maintenance.
2. Increases the amount of light for the customer, at no increase in power costs.
3. Restores lighting intensity to the initial (new) installation values.
4. Maintains an attractive appearance of the lighting system.
5. Eliminates "blinking" and "swirling" effects in lamp tubes, through correction of troubles as soon as they occur.
6. Prevents troubles resulting from defective or overheated ballasts, such as dropping of melted compound, by correcting faults or installing new ballast.

7. Reduces time consumed in maintenance, by using trained specialists to do the work.

8. Provides maximum lighting efficiency at the lowest cost possible.

When a new customer is signed up, a folder is made out and tabbed with the customer's name. The signed contract is placed in this folder. A 5 in. by 7 in. record card is then made out, showing the customer's name, address, telephone number and monthly billing charge.

A truck maintenance crew is next authorized to make the initial service call, and to put the customer's lighting system in first class operating condition. Upon completion of this work, the maintenance crew fills out a "work form", showing the job number, nature of work done, time consumed, and materials used. The office secretary then converts the "time" and "materials" into "costs", and enters all details on the back of the record card. The "work form" is then filed in the customer's folder.

Billings are made to the customer monthly, and receipts are promptly entered on the face of the record card. Work forms are made out for all subsequent service calls, and details en-

*Unsurpassed for  
Quality*



To provide the most dependable circuit control with the smallest mechanism for the longest service available in a 6 amp. "T" rated 125 volt switch. Your assurance of unsurpassed quality based on the superior performance record of McGill LEVOLIER Switches during the last 30 years. Should any No. 41 LEVOLIER Switch fail in lighting circuits, replacement will be made free of charge. Underwriters' Laboratories Inspected.



**MODEL NO. 25**  
6 amp. "T" rated  
—125 volt; 3 amp.  
—250 volt. Toggle  
switch.



**MODEL NO. 400**  
3 Speed SP Switch  
for Fan Motor. 1,  
2, 3, off.



**MODEL NO. 71**  
6 amp. "T" rated  
—125 volt; 3 amp.  
—250 volt.  $\frac{3}{16}$ "  
thick.



**4100 SERIES INDUS-  
TRIAL SOCKETS**  
660 watt — 250  
volt.  $\frac{1}{8}$ ,  $\frac{3}{8}$  and  
pendant cap.

AVAILABLE FROM YOUR ELECTRICAL WHOLESALE



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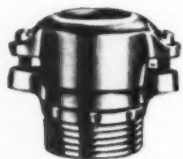
**ONLY McGILL MAKES Levolver SWITCHES**

# FOR NEATER STRONGER AND BETTER JOBS

## SPECIFY AND INSTALL B-I FITTINGS AND FIXTURES



**B-I** No. 1426 Conduit Entrance Caps. Special high strength, non-corrosive aluminum alloy. Easy and positive to position. Filister head cap holding screws. Threads clean and full cut. For 2, 3, 4, or 5 wire service.



**B-I** No. 600 Watertite Connectors for Service Entrance Cable. Smooth, non-rusting casting fitted with live rubber grommet for long time protection. Clean, easy running threads and tapered point screws for faster installation.



**B-I** No. 711 Service Entrance Cable Heads. Cast aluminum body with separate cover. Heavy steel cable clamp. Large key-hole mounting for easy attachment to building.



**B-I** No. 3626 Steel Clad Wire Holders. Heavy steel base and supporting strap,  $\pm 22$  square shoulder screw. All parts hot dip galvanized. Porcelain has compression strain only. Smooth, rounded surfaces protect wire insulation. REA approved.

LOOK FOR THE **B-I** WHEN YOU BUY

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**BLACKHAWK INDUSTRIES**  
DUBUQUE, IOWA



Entrance Cable Fittings - Sill Plates - Box  
Supports - Conduit Entrance Caps - Staples -  
Connectors - Cable and Conduit Straps -  
Locknuts and Bushings - Wire Holders - Yard  
Lights - Fluorescent Brackets

tered on back of record card after time and materials are converted to costs. Total receipts and total costs are thus shown on the record cards, showing at a glance the status of the contract at all times.

Ample stocks of replaceable items are carried by Fluorescent Service Company to service the number of fluorescent lamps they have under contract, and averages about as follows: 300 ballasts, 3000 starter switches, 2400 standard 40-watt lamps, 500 slim-line lamps and 1000 miscellaneous sizes, types and colors of standard and special lamps.

William Stern offers a number of suggestions for making a success of fluorescent lighting maintenance service by contract. A minimum of 100 contracts is needed to start a contract maintenance service, he advises, as this many contracts are needed to keep one truck crew busy all the time. Enough contracts must be kept in force to keep all personnel busy. This is the only way to keep prices low enough to make this service attractive to customers.

Two maintenance men per truck is ideal for servicing the average contract, but with two or more trucks operating, a third man to act as supervisor of truck crews, and to work with one crew on difficult jobs, is desirable. One truck with a two-man crew can handle from 100 to 150 average size contracts, or a correspondingly smaller number of larger contracts.

Customers are encouraged to telephone Fluorescent Service Company for service when any lamp burns out, or when any other trouble develops. Each such call provides a contact with the customer, and impresses on the customer the dependability of this specialized service. He feels that he is getting his money's worth when he sees the service crews on the job, which helps considerably in getting contract renewals.

Stern follows the practice of replacing lamps as they burn out, or when the lamp ends look overly blackened during periodic cleanings. New lamps are "dated" when installed, and lamp life checked when the old lamps are removed. Group replacement of lamps has been studied, but has not been practiced, as studies made do not justify group replacements on the average size job under contract.

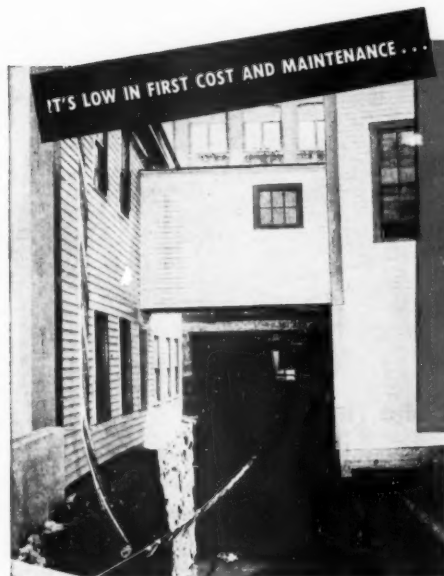
Louvers on standard fluorescent luminaires are cleaned by removing from luminaires and dipping in a long narrow tank containing a solution of water and Soilax, a detergent which quickly dissolves grease and dirt.



Pre-assembled cable, messenger and binder construction goes up fast and easy — all in one operation. No special equipment or technique is required. Important time and installation costs are saved.



Full support between points of suspension is provided by a Copperweld messenger, bound to the cable by a spirally wound metallic tape. This simple *all-in-one* construction (cable, messenger, binder) results in a compact cable design that requires little space, makes a neat appearing installation.



Installation economies provided by Hazard Self-Supporting Cable design reduce your first costs. And once up, little or no maintenance is required. Lasting protection against the roughest weather, tree branches, sun, oil, moisture, etc., is provided by the exceptional mechanical strength of the cable design, the well known, tough characteristics of a Hazaprene (neoprene compound developed by Hazard) Sheath, and the long-aging, moisture resistant qualities of Hazard Watertite inulation.

# HAZARD



## SELF-SUPPORTING AERIAL CABLE

Typical of the benefits and advantages gained through the use of Hazard Self-Supporting Aerial Cable is this neat appearing installation at The L. S. Starrett Company, Athol, Mass. More and more industrial plants, as well as utilities are turning to self-supporting cable in answer to today's needs for circuit expansion and modernization. A wide variety of cable designs meets all types of service requirements.

It will pay you to write for full information about the advantages of Hazard Self-Supporting Aerial Cable or ask your Hazard representative. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

# HAZARD

Insulated wires and cables for every electrical use



8375

# America's Most Admired Fixture!



**Illumination PLUS  
Point-of-Sale Merchandising  
Wins New Friends for**

## *Leader* OFFICER

**VL and NHC Series**

### **LEADER VL-440 SPECIFICATIONS**

Housing, channel and deep drawn end caps of 20 gauge steel, finished in white, high-gloss baked enamel. Extruded tubular side panels and moulded one-piece louver is of glowing white plastic that is warp-proof, colorfast, and destaticized. Louver swings down for easy servicing. Choice of 31" or 45" shielding. May be used as single units or in continuous runs—suspended or ceiling mounted. VL Series uses 2, 3 or 4 40-watt 48" T-12 lamps. Wired units include UL and ETL approved sockets, type FS easily replaceable starters and two high p.f. 2-lamp ballasts. Conventional 110-125 volts, 60 cycle A.C. Other voltages on request. NHC Series available for use with Slimline tubes and for 120, 200, 300 or 425 milliampere operation in lengths from 48" to 96".

You'll find this attractive fixture installed in the most tastefully decorated offices, stores and office buildings. The "Officer" not only adds to any decorative effect, but helps sell goods and services through appealing highlighting of floors, furniture and display sales material. The LEADER "Officer" is rich in construction, too. For example, it is provided with the famous LEADER one-piece louver of destaticized plastic... a louver with a multitude of small, rigid apertures—made possible by one-piece molding—to provide excellent shielding and soft, gracious light-diffusion.



*Leader America's No. 1 Lighting Equipment Manufacturer*

LEADER ELECTRIC COMPANY • 3500 NORTH KEDZIE AVENUE • CHICAGO 18, ILLINOIS

# Modern Lighting



**INADEQUATE LIGHTING** and unsightly display of merchandise are replaced by . . .



**LOUVERALL LIGHTING** system, new display cases improves appearance.

## New Lighting Modernizes Drug Store

Before modernization, the Brundage Drug Store in Muskegon, Michigan, presented an old-fashioned, cluttered-up appearance. The lighting was inadequate, with enclosing globe fixtures spaced at wide intervals providing about eight footcandles of illumination average, and a wide variation in intensity throughout the store. Display fixtures were of the old open-shelf type, and the ceiling was of the obsolete ornamental metal pan construction. The display of merchandise was haphazard, and appearance of the entire store interior was such that it was a distracting influence on shoppers and customer prospects.

Complete modernization of this old-fashioned drug store has streamlined

its appearance and eliminated the many distracting influences. Attention is now focused on the merchandise itself, which is displayed in an orderly manner in new illuminated floor and wall cases. A wall-to-wall louverall luminous ceiling was suspended to conceal the old unsightly beams and old-fashioned embossed metal ceiling, and to provide a high level of lighting distributed uniformly throughout the store. Other features of the modernization include new light finishes on the side walls and modern light color finish on the wall and showcases, which add to the general atmosphere of cleanliness and cheerfulness and also help to increase the general level of lighting.

The louverall ceiling consists of aluminum louver panels each of which is 32 inches square containing 100 individual cells with 45-degree shielding. This ceiling is suspended from the original ceiling by means of adjustable hanger straps. Installed three feet above the louver panels in the front portion of the store are single-lamp slimline fluorescent lighting strips spaced 24 inches on centers. The lighting strips at the rear of the store are installed only 18 inches above the louvers. The lighting strips, specially designed for use with the louverall ceiling, are surface installed on the old original high ceiling.

Fluorescent lamps have also been installed in floor cases, and concealed above the wall cases along the sides of the store to light the packaged goods on the wall case shelves. These same lamps also illuminate the upper side walls softly as well as the opaque letter signs.

Lighting equipment used consists of Sylvania Electric Products, Inc., new type Flexi-Module louverall ceiling, and new CR-80 and CR-150 light strips with reflectors. Jones Electric Company, electrical contractors of Muskegon, sold and installed this modern planned lighting installation.

## Three Decades of Office Relighting

Interesting case history of office lighting modernization extending over three decades is that of the W. H. Barber Oil Company in Minneapolis, Minnesota. Back in 1920, a maximum of three to five footcandles of illumination was provided by 59- to 200-watt enclosing glass incandescent fixtures consuming a total of 11,800 watts. When the first relighting project took place in 1935, the original fixtures were replaced with 500-watt Super-Lite Silvray semi-indirect units. Average footcandle intensity was upped to 20, but the total lighting load for the office was now 29,500 watts. At the time, that was not too bad—a 300 percent increase in lighting for an increase of 150 percent in connected load.

Then came the advent of fluorescent lighting with its relatively high intensity output on comparatively lower current consumption. Recommended minimum lighting intensities were climbing and 50 footcandles soon became standard for office work. While



**KAYLINE**  
the one source lighting line

**THE NEW  
SELLING TOOL**



You'll find the new Kayline Catalogue #50 one of your best tools for selling modern lighting. Its full range of incandescent, fluorescent and slimline residential, industrial and commercial lighting fixtures will meet your every need. They will assure you of customer satisfaction. Send for Kayline's Catalogue #50 today!

See Sweet's  
Architectural File  
Section 31A-12



**THE KAYLINE CO.**  
2480 East 22nd St.  
Cleveland, Ohio

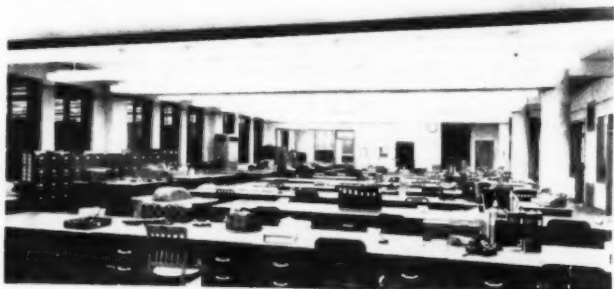
**KAYLINE**  
the one source lighting line



**ORIGINAL LIGHTING** in 1920 with 59 200-watt enclosing globe units provided from 3 to 5 foot-candles intensity.



**FIRST RELIGHTING** in 1935 with 59 500-watt Silvray units upped intensity to 20 foot-candles but more than doubled power consumption.



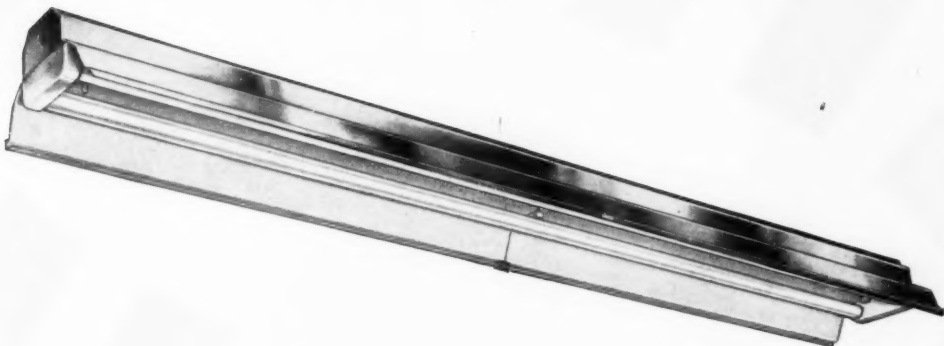
**SECOND RELIGHTING** in 1949 used 151 Garco "5050" fluorescent units (2 40-W lamps each) in continuous rows to provide 50 foot-candles.

writing off their first lighting modernization project, Barber Oil Company carefully watched development of modern fluorescent lighting practice. Last year, the company decided to relight their offices for a second time.

The latest installation consists of 151 Garco "5050" fluorescent fixtures, each containing two 40-watt 3500 degree white lamps. The units are suspended 24 inches from the ceiling in continuous rows on 7-foot centers.

# Modern as tomorrow!

## New Wheeler RLM "Industri-Line" Slimline Fixtures



An outstanding, progressive step in Industrial Lighting! Wheeler Engineers have built into these newly-designed line of units 6 Better-Value Features. For greater value, greater efficiency, insist on Wheeler R.L.M. Slimline Fixtures!

- ★ High Output: gives more light per foot of lamp length.

- ★ Latest G. E. Turret Type Lampholders (depressable): for single pin contact, making lamp insertion and removal easy.

- ★ Reflectors in Sections: for greater ease in handling, each unit furnished with two open-end or closed-end porcelain enamel reflectors.

- ★ Individual or Continuous Mounting: extremely simple mounting operation.

- ★ One-piece Top Channels: made of heavy gauge steel. Finished in either porcelain enamel (recommended where excessive moisture conditions exist) or baked synthetic enamel.

- ★ Designed for use with two and three T-12 Slimline Single-Pin Lamps: Instant starting.

Get complete details from Wheeler Reflector Company,  
275 Congress Street, Boston 10, Massachusetts.

# *Wheeler*

## REFLECTORS

Distributed Exclusively  
Through Electrical Wholesalers

MADE BY SPECIALISTS IN

"SKILLED LIGHTING"

EQUIPMENT SINCE 1881

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There's an

### **INTER-MATIC**

Sale and Installation  
for You!



Establish yourself among your customers as an expert on the selection of Time Switches. Standardize on Inter-Matic—the Time Switch that will back up your judgment with the kind of performance users want.

#### THESE ARE THE FEATURES THAT MAKE IT PREFERRED:

- EASY TO REMOVE MECHANISM—just press spring.
- EASY TO SET TIME—Just pull dial forward—turn in either direction.
- EASY TO ADD EXTRA TRIPPERS without removing the dial.
- EASY TO CHECK OPERATION of the motor thru window in motor cover.

#### UNDERWRITERS APPROVED

Rated at 35 amperes, 125 volts  
Heavy duty . . . for all control purposes

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**\$10<sup>95</sup>**  
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up  
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Chicago

### **INTER-MATIC**

## TIME SWITCH

#### COMPARISON OF WATTAGE VS. INTENSITY

| Year | No. and Type of Units  | Total Wattage | Percent Change In Wattage      | Average Foot-Candles | Percent Increase In Foot-Candles |
|------|--|---------------|--------------------------------|----------------------|----------------------------------|
| 1920 | 59 200-W Enclosing Globe   | 11,800        | .....                          | 3 to 5               | .....                            |
| 1935 | 59 500-W semi-indirect Silvray units                                       | 29,500        | +150                           | 20                   | 300                              |
| 1949 | 151 100-W (2 40-W lamp) Garcy 5050 Fluorescent fixtures on continuous rows | 15,100        | -49 over 1935<br>+28 over 1920 | 50                   | 150 over 1935<br>900 over 1920   |

After 250 hours of operation, they now have a maintained intensity of 50 foot-candles. While the increase in intensity over the previous system was 150 percent, the total connected lighting load was decreased by 49 percent. Based on their original installation in 1920, they now have 900 percent more light with only a 28 percent increase in lighting load. And this is one of the first installations in Minneapolis utilizing 45 degree lengthwise and crosswise shielding.

Equally interesting, from the standpoint of business relations, is the re-

ported fact that the fixtures for all three installations (encompassing a span of about 30 years) were furnished by the same electrical distributor—Graybar Electric Company, Inc., in Minneapolis. And the two relighting projects were installed by the same electrical contractor—Williams Electric Company of the same city. Lighting recommendations for the last installation were made by engineers of the Northern States Power Company in Minneapolis. Fleming & Associates in the same city represented the fixture manufacturer.



**SEEING** is the biggest factor in safety, or so the architect for the Line Material Co. office building in Milwaukee believes. The novel method of lighting the stairwells in this building as seen in the above photo, were selected by Maynard W. Meyer, architect, and Art Wanty, Elm Grove (Wis.) lighting consultant. Fabricated by Northern Light Co., the 40-foot long vertical unit is made of extruded aluminum tubing and supports two rows of T-12 single-pin fluorescent lamps. The unit in each of the two stairwells extends from basement to ceiling, and is supported only at these two points. Electric Sales and Engineering Co. installed these units.

*For More Than Sixty Years*  
**CRESCENT WIRES & CABLES**  
*Have Played A Leading Role In*  
*The Growth Of The Electrical Industry*



**CRESCENT INSULATED WIRE & CABLE CO.**  
**TRENTON, NEW JERSEY**

# Get *Your* Share of the Farm



These photographs are typical of the way RoBarn is used . . . under hazardous conditions . . . safely. Note the dripping water pipe, the exposure to body moisture and corrosive fumes. RoBarn's Neoprene construction with reinforcing glass braid resists moisture, flame, acids and mechanical injury. It is stronger . . . electrically and physically . . . than conventional non-metallic sheathed cable. It is a quality product made for safe and dependable service.





# Market with Rome RoBarn

## THE ORIGINAL AND SUPERIOR NEOPRENE NON-METALLIC SHEATHED CABLE



Rural electrification and farm wiring are at an all-time high. That means a really big market for new wiring and rewiring jobs. You can get your share of this business if you sell a safe, durable cable . . . RoBarn.

It's easy to sell farmers the advantages of wiring with RoBarn. Its unusually high resistance to flame, moisture, ammonia fumes, uric acid and physical abuse reduces shock and fire hazards. That means lower insurance risks, greater safety and protection from loss for the farmer. RoBarn cannot mold, rot or oxidize. Its long life eliminates expensive rewiring.

The high quality of RoBarn is attested to by its approval and acceptance in the country's largest farming area . . . by millions of feet now operating safely. Further, RoBarn carries Underwriters' approval as non-metallic sheathed cable, having "adequate fungus resistance and other necessary properties for use in cow barns and other locations where it would be subject to conditions of heat, cold, moisture, corrosive fumes and fungus." RoBarn, therefore, is the superior wiring material for many general purpose applications where conditions are hazardous.

Send for the RoBarn folder and see why it is the cable you can sell easily and with confidence.

### TO HELP YOU SELL



The new RoBarn individual coil carton gives your customers a convenient and attractive package that makes work easier. And, when they see the clearly marked carton on your shelf, they know it is the original and superior Neoprene non-metallic sheathed cable.

### Cut Inventories with Rome Dual-Purpose Type RW or Type RH Building Wire

ROME RW-60°C OR RH-75°C 600 V

Rome "Dual-Purpose" Building Wire is Underwriters approved for use as either Type RW at 60° C. in wet locations, or Type RH at 75° C. in dry locations, with current carrying capacities as permitted under NEC. Uniformly small in diameter, easy to strip and pull, Rome "Dual-Purpose" Building Wire reduces inventories for wholesaler and contractor alike . . . a single wire suitable for use as Type RW or Type RH. Look for the name "Rome" and the "Dual-Purpose" marking printed on the surface.

**It Costs Less To Buy The Best**



**FLUORESCENT  
FIXTURE PERFORMANCE  
DEPENDS ON  
BALLAST QUALITY**



**SOLA**

Sequenstart\* Ballasts

## keep your light output constant

within  $\pm 2\frac{1}{2}\%$  regardless of line  
voltage fluctuations of  $\pm 15\%$ .

### what this means to you

Greatly varying electrical loads have made large line voltage fluctuations common. The patented SOLA Constant Wattage design of Sequenstart\* Ballasts insures constant light conditions, builds user satisfaction and places fluorescent lighting on a new level of dependability.

### compare SOLA with any other ballast

Here are the significant advantages of SOLA Sequenstarts\* over conventional ballasts:

- Regulated light output through patented constant wattage design
- Cooler operation because of ventilated capacitor compartment
- Less wattage loss, lighter in weight and more compact with Sequenstart\* circuit design.

We will be happy to answer any questions you have about ballast design and application. You are invited to write for the technical bulletin giving complete electrical and mechanical specifications of SOLA Constant Wattage Ballasts. Request Bulletin J-PFL-144.

Compare ballast performance — then specify the outstanding performer.

**SOLA**

Sequenstart\*

Constant Wattage BALLASTS

**SOLA ELECTRIC COMPANY**

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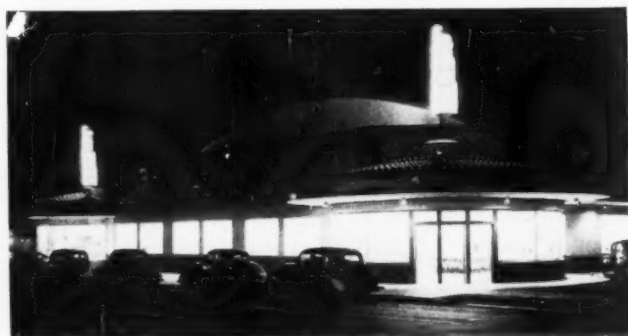


**EGGCRATE PANELS** beneath slimline lamps and adjustable incandescent spotlights provide 50 footcandles of illumination to cars displayed behind all-glass front of the Don Lee Cadillac showroom.

### Slimlines Light Auto Salesroom

Ten modular slimline semi-recessed ceiling panels and an equal number of recessed incandescent spotlights are installed in the Don Lee Cadillac showroom in Sherman Oaks (Los Angeles). They provide an average of 50 footcandles of illumination at hood-height of the cars on display. With 712 watts installed in each 4- by 8-foot panel and

with 150-watt recessed spots, the lighting plan results in an effective presentation of the cars. Each panel includes eight slimline lamps operating at 300 ma., and shielding is provided by small-cell eggcrate louvers. Designed by architects Duel, Conklin and Coleman, the installation is the work of the Kersey Kinsey Company.



**CONTINUOUS ROWS** of two-lamp exposed 40-watt fluorescent lamps on 11-foot centers provide 58 footcandles of illumination in the S & K Market, San Fernando, California. Lamps number 494, resulting in a connected lamp load of  $2\frac{1}{2}$ -watts per sq. ft.

### Even Diffusion With Luminous Ceiling

Translucent Plexiglas panels, shielding fluorescent lamps and resting upon a louvered grid 9 feet above the floor, provides an all-luminous ceiling for the combination elevator lobby and reception room of the Oklahoma Natural Gas Company in Tulsa.

The fluorescent lamps (40-watt 4500-degree white) are mounted in continuous rows but, since two levels of illumination are desired (for casual reading by visitors and for secretarial typing) rows are spaced on 21-inch centers over lobby chairs and on 12-inch centers over the secretary's desk. The result is a brightness balance that accomplishes visual efficiency and comfort.

# ELECTRO cuts 1 man out of 2 from your installation picture!



- Exclusively ELECTRO'S... the patented ONE-MAN SPEEDY HANGER
- Enables 1 man to install ELECTRO fluorescent luminaires
- Saves thousands of costly man hours
- Simple and positive in operation
- Drastically reduced maintenance costs



## "A BIG SAVING ON EVERY JOB"

Says Harold Kilburg, Sr.  
Kil-Bar Electric Co., Chicago

"On job after job, my records prove that the ELECTRO Speedy Hanger has reduced installation man hours as much as 50%. This important savings and the simple efficient design of the Speedy Hanger help make for a more satisfactory installation at a lower cost, every time."



### 3 EASY STEPS

#### STEP 1

Attach *Speedy Hanger* to outlet box for surface mounting... or twin stem set for pendant mounting. Remove knockouts; pull wire leads through.



#### STEP 2

Hook fixture suspension clips on to tabs on *Speedy Hanger*, and make wire splice.



#### STEP 3

Depress spring-tension pins and roll fixture into *Speedy Hanger* slots. Lift fixture into position. Attach 2 wing nuts.

—THAT'S ALL!



## ELECTRO MANUFACTURING CORPORATION

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EYE-EASY  
*lighting*  
COST-EASY  
*maintenance*

GUTH  
4 ft. *slimline*

- + Quick starts
- + No starters or starter troubles
- + Lowest fluorescent maintenance
- + Easy-to-handle—one man can get it through a door
- + Single pin—simple to change
- + Available in every two and four 40W fluorescent fixture in the entire GUTH line

**Guth**

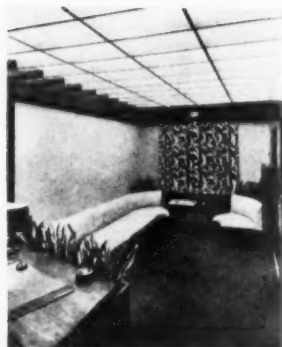
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**LIGHTING**

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI



*Leaders in Lighting Since 1902*



**PLEXIGLAS** panels and ceiling louvers beneath continuous rows of fluorescent lamps provide low-shadow low-glare two-level lighting for casual reading by visitors and critical seeing tasks by the secretary in this reception room and elevator lobby. Spacing of lamps is 21 inches, center to center, above elevator doors and lobby sofas, and 12 inches c-to-c above the desk area.

With an original 12-foot ceiling and a present suspended ceiling height of 9 feet, bare lamps can be located sufficiently far above the Plexiglas panels to give even diffusion and brightness.

In area, the room roughly measures 9 by 22 feet. The ceiling is painted flat white (81 percent reflectance); walls consist of tan plaster, dark brown paneling and predominantly green drapes (RFs of 46-, 13- and 45-percent respectively); carpeting is a 6-percent RF red, and sofa upholstery is 30-percent RF yellow.

Guests awaiting appointments are provided with 42 footcandles of lighting intensity (20 ftc. on a 45-degree reading plane) while the secretary receives 52 ftc. on the horizontal desk surface and 30 footcandles when reading matter is held at a 45-degree angle.

With louvers measuring 4 inches in depth and arranged on a 17- by 27-inch plan, the large expanse of ceiling brightness is psychologically reduced. And, with panels easily removable, the area above the ceiling is readily accessible for relamping and maintenance.

This room, with no exterior windows, has a pleasing, sunny atmosphere. Shadows are minimized and specular reflection is negligible due to the diffuse quality of the light.

The installation (part of a modernization program of an existing building) is the result of cooperative effort by Dale H. Watt, professional engineer; J. Myers Jr. of the Tulsa Public Service; A. N. DeEspensa, Tulsa-Lawson Electric Company; George Watts, Guth Fixture Company; and Fred Wolcott, designer for the Oklahoma Natural Gas Company.

# LOW in COST



# LONG on LIFE

Low in cost, long on life. That's the simple story of ANHYDROPRENE Wires. And those are the reasons why it pays to remember ANHYDROPRENE whenever you're planning new transmission and distribution systems, or are preparing to rewire those already in use.

ANHYDROPRENE Wires consist only of conductor, the famous Anhydrex insulation, and a thin, but tough, neoprene jacket. On some of the large sizes a tape is inserted between insulation and jacket. This simple construction establishes low purchase cost and produces a small-diameter, lightweight wire that's inexpensive to install.

ANHYDROPRENE construction also provides sound electrical and physical properties. There's the low water absorption and high dielectric strength of Anhydrex insulation. There's the resistance to abrasion, acids, corrosive chemicals, light and flame of the neoprene jacket. At 8000 volts and under, ANHYDROPRENE Wires can be operated at copper temperatures as high as 75°C. These features assure trouble-free service year after year, even under unfavorable conditions. And long, trouble-free service means low installation costs and infrequent replacements.

ANHYDROPRENE Wires can be racked on walls and installed underground in ducts. You'll find them especially dependable for plant and shop wiring; for instrument wiring; as underground primaries, transformer leads, and pole line risers; and in signal and control circuits.

## Simplex

## WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.



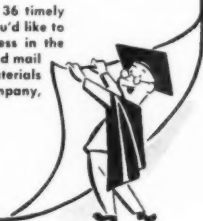
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- ☐ Remote-Control Wiring Manual #16-200—comprehensive 35-page report covering all aspects of General Electric's new remote-control wiring system. Includes suggested applications, advantages of remote control, description of components, circuit diagrams, specifications, and installation procedures.
- ☐ Q-Floor Data Manual #18-136—comprehensive 104-page reference manual for architects and consulting engineers. Covers product listings, layout design data, and dimensional diagrams.
- ☐ Building Wires Booklet #19-48—12 pages of information and selection hints on General Electric's complete line of building wire and cable.
- ☐ Fluorescent Starter Wall Chart #16-267—lists, in handy chart form, catalog numbers, wattages, and bulb sizes. Aids selection of proper fluorescent starters.
- ☐ Fiberduct Data Manual #18-117—comprehensive 80-page manual covering all details of General Electric's Fiberduct underfloor distribution system. Prepared specifically for consulting engineers and architects.
- ☐ Flamenol® Wire and Cable Booklet #19-180—12 pages covering development, types and uses of G-E Flamenol cables. Tables list selection data and properties.
- ☐ Heavy-duty Switch Bulletin #16-190—announces features and advantages of new G-E heavy-duty switch.
- ☐ Flexible Conduit Broadside #18-238—covers in general the wide variety of flexible steel conduit applications.
- ☐ Magnet Wire Catalog #19-329—32-page booklet details G-E magnet wire data. Specifications, properties, uses and advantages of various types are among subjects thoroughly covered.
- ☐ Grounding Outlet and Plugs Bulletin #WDF-173X—describes new line of specially designed G-E grounding outlets and plugs.
- ☐ Rigid Conduit Installation Hints Broadside #18-190—twenty illustrated tips on installing rigid conduit.
- ☐ Portable Cord Chart #19-199—attractive, quick-reference chart for simplified selection of G-E portable cords.
- ☐ Renewable Fuse Folder #16-238—illustrates and describes ferrule- and knife-blade types of G-E renewable fuses. Chart shows catalog numbers and ratings.
- ☐ Levelock Switch Box Folder #18-100—illustrates 5 new Levelock features designed to solve common switchbox installation problems.
- ☐ Selection of Proper Cable Sizes Booklet #19-269—dimension, voltage drop, and current-capacity charts make this booklet a handy reference for many cable selection problems.
- ☐ Watch Dog® Starter Folder #16-309—lists Watch Dog starter types and sizes, explains Watch Dog advantages.
- ☐ How to Wire and Estimate Q-Floors #18-90UF—concise folder gives estimating and installation advice for Q-Floor raceway layouts. Complete with drawings and job-site photographs.
- ☐ Magnet Wire Bulletin #19-100—nutshell summation of G-E Formex® and Deltabeston® magnet wires.
- ☐ Silvend® Fuse Folder #54-49—provides full data listings, features, and uses of G-E Silvend fuses.
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- ☐ Switch and Outlet Boxes Folder #18-219—describes General Electric switch and outlet box line.
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- ☐ Flamenol Bus-drop Cable Folder #19-209—covers installation information, specifications, and accessories for G-E bus-drop cables.
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- ☐ Bar Hanger Folder #18-47—describes S-type bar hanger with new heavy-duty stud, for residential wiring.
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- ☐ Rigid Conduit Folder #18-248—informative folder describes features and installation of G-E "White" and G-E "Black" rigid conduit.
- ☐ Save with Deltabeston Power Cable Folder #19-159—features economies of Deltabeston installations.
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\*Reg. Trade Mark of General Electric Company

That's right—look over this list of 36 timely G-E publications. Check the ones you'd like to have. Write your name and address in the margin—then, tear out this page and mail to Section K52-118, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.



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We suggest that you tear out the bottom card before you start reading the following pages. Keep the card handy. You might even use it as a book mark in case you are unable to complete reading the following pages at one sitting. Then, as you see some new products about which you want to know more, just circle on this card the number which appears at the top of the item describing the new product or catalog. Circle each number on this card which corresponds to the number on the item in which you are interested.

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Electrical Construction and Maintenance is written for you by a large staff of editors and consultants, each an authority on some phase of the business. They will be glad to give you expert advice and answers to your questions.

other problems? turn the page for the answer.

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Do you have a problem in wiring layout, motor control, lighting technique?

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# Product News



**Motor Starter**

(1)

A new combination Life-Linestarter, Class 11-206-N, combining motor starter, motor protection, and disconnect in a redesigned enclosure, is now available. Designed for across-the-line starting of squirrel cage induction motors, or as a primary switch for wound rotor motors, unit features the Life-Linestarter, AB De-ion circuit breaker, and slamproof self-indicating interlocked handle. With capacities from  $\frac{1}{4}$  to 100 hp, and 110 to 600 volt polyphase, unit is available in NEMA sizes 0 through 4, and NEMA type enclosures, 1, 1A, 3, 4, 5, 7 and 9. For use with up to three safety padlocks, the slamproof self-indicating handle is also interlocked to prevent opening of enclosure when breaker is closed.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.



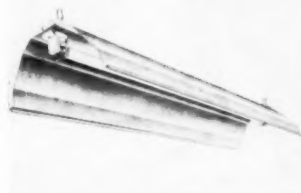
**Reel**

(2)

The new 7S series reelite has been developed. It pays out and automatically retracts up to 25 feet of extension cord for lighting (or portable

tool power supply) on loading platforms, in commercial or private garages, in stockrooms, for machine inspection or maintenance work. It incorporates continuous swivel action, permitting hand-lamps or other devices to be used anywhere in a 50 foot circle without cord tangling or current interruption. Rated at 10 amp, 250 volt, it is installed on any overhead 4 inch octagonal outlet box. Available accessories include six types of hand-lamps, a machine tool connector body, and a key socket. A vaporproof model is available with vaporproof hand-lamp attached.

Appleton Electric Company, 1701 Wellington Ave., Chicago 13, Ill.



**HIGH BAY REFLECTOR** for mercury lamps has been developed. The 3 kw reflector provides 55° crosswise shielding. Fixture is equipped with lamp-holders, drop guards and wire connecting boxes, and heavy duty hanging loops. Manufactured by Edwin F. Guth Company, 2615 Washington Avenue, St. Louis 3, Mo.

**Fluorescent Lamps**

(4)

Four new fluorescent lamps have been added to this line. They are the deluxe cool white and the deluxe warm white, to compensate for the unnatural appearance which people and color sensitive objects take on when under standard fluorescent light. The other two lamps are the standard cool white, formerly the 4500° white, which is recommended for business establishments, schools and factories or other places, where a cool atmosphere is desirable, and the standard warm white, formerly warm tint, for high efficiency lighting in warm atmospheres where fluorescent lamps are used in conjunction with incandescent lighting.

Solar Electric Corporation, Warren, Pa.

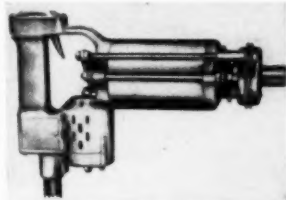


**Multi-Breakers**

(5)

Announcement has been made of a complete line of raintight Multi-breakers extending from 1 through 20 circuits. They are Underwriters' approved as raintight (NEMA type 3) for outdoor use. Conduit hubs are furnished in a variety of sizes in top, and all knockouts in sides, bottom and back are below the lowest electrical part. Multi-breakers combined with these new enclosures offer many features for outdoor use. They are equipped with thermal-magnetic operating mechanism which combines the advantages of both thermal and magnetic tripping elements. Similar multi-breakers are available for indoor use with combinations from 1 through 42 circuits.

Square D Company, 6060 Riwad St., Detroit 11, Michigan.



**Hammer Drill**

(6)

A new electromagnetic hammer drill, No. 10-RO, for high speed hole drilling in concrete, brick and stone, has been added to this line. Automatic rotation of carbide-tipped spiral drill speeds up hole drilling, eliminates manual turning of drill chuck and reduces fatigue. Automatic rotation of drill bit is accomplished by a rubber ratchet mechanism actuated by the recoil of each blow of the hammer's piston.

Syntro Company, 690 Lexington Ave., Homer City, Pa.

TALK OF THE TOWN

## MODERN FITTINGS FOR

- thinwall conduit
- rigid conduit
- metallic and non-metallic cable
- flexible steel conduit
- service entrance cable
- grounding devices
- lighting fixture fittings

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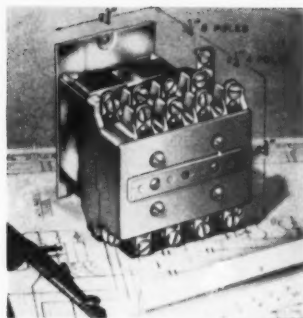
**midwest**

midwest electric mfg. company  
1639 walnut street  
chicago 12, ill.

*Representatives in Principal Cities*







**Contactors (7)**

A new small Size 00 multi-pole convertible contactor, designated Type "CRA", measuring  $2\frac{1}{4}$  by  $2\frac{1}{4}$  inches, is available. It provides instant circuit conversion by means of reversible contacts. Unit consists of four basic parts: frame, containing magnet, coil and right angle mechanism; movable contact unit; stationary contact unit; stationary contact base, and mat-finished contact cover plate. Coil connecting wires are of a predetermined length so that they hug the frame. Movable, or "floating" contact unit is mounted direct to carrier bar of right angle mechanism by two screws. Moving contact unit is self-aligning with contacts in stationary contact base. They are reversible without disassembly of contactor. Contactor is available in 2 to 8 pole types for requirements of 6 to 600 volts ac and 6 to 230 volts dc.

*Arroe-Hart & Hegeman Electric Company, 103 Hazethorn St., Hartford 6, Conn.*



**Earth Handling Machine (8)**

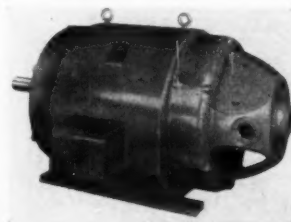
A new type of earth handling machine, known as the "power digger" has been developed. It is a heavy duty digger that works behind a tractor, with the hydraulic pump, independently mounted, operated from the power take-off shaft of the tractor. All digger motions are hydraulically op-

erated. It has a belowground surface reach of eight feet and a 10 foot digging reach behind the tractor with a 140 degree swinging arc. Bucket can be raised high enough so as to load any standard size dump truck. It can be used for excavating trenches, basements, footings, culverts, drains, loading operations, moving rocks and for underground utility repair work. Standard hoe-type shovel cuts an 18 inch wide trench and has a capacity of 3.5 cubic feet.

*Sherman Products, Inc., 3200 W. 14 Mile Road, Royal Oak, Mich.*



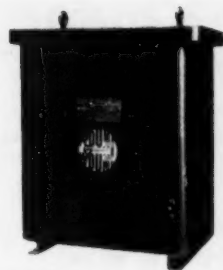
**SLIMLINE** fluorescent fixtures, 200 ma, have been announced. Available in one, two, four or six lamp models. Adaptable for individual or end to end, suspended or flush mounting. They carry Underwriters label. Manufactured by Colonial Electric Products, Inc., East Paterson, N. J.



**Induction Motors (10)**

A new line of heavy-duty, wound-rotor induction motors has been announced. They provide variable speed drive, and are advantageous on applications requiring high starting torque and low starting current, or long acceleration periods. Built in ratings from 30 to 1500 hp, drip-proof construction is furnished as standard. Splash-proof or enclosed, forced-ventilation models are also available. Motors are available with either ball or split-sleeve type bearings. Brush pressure is adjusted with a ratchet wheel brush tension adjuster which provides metered step-by-step increase or decrease of pressure on individual brushes.

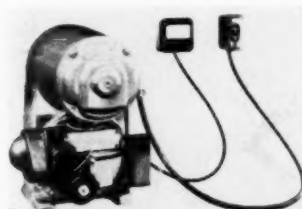
*Electric Machinery Mfg. Company, Minneapolis, Minn.*



**Transformers (11)**

This line of dry type transformers has been redesigned. All sizes feature the round wound construction. Moisture resistant insulating materials are vacuum impregnated with heat resisting insulating varnish. All dry type transformers,  $1\frac{1}{2}$  through 50 kva, are wound with Class "B" insulation which permits an average coil temperature rise of 80° C at continuous load operation. The  $1\frac{1}{2}$  through 10 kva sizes have been approved by Underwriters Laboratory, Inc. These sizes are furnished with a bracket for wall mounting and are equipped with two steel eyebolts on top of a tank to facilitate hoisting. The remainder of the sizes have lifting lugs on both sides of the transformer tank.

*Line Material Company, Milwaukee 1, Wis.*



**Remote Control (12)**

A new electric remote control for Speed-Trol, variable speed, electric power drives has been announced. It is a package unit design, which may be mounted on any size Speed-Trol of current design by the user in the field as well as being available with new Speed-Trols. Unit includes mounting bracket, reversing motor, chain and sprockets, friction clutch, chain guard, and remote "Fast-Slow" station. Available either with or without an electric remote speed indicator. Power drives are available in ratings of  $\frac{1}{4}$  hp to 25 hp.

*Sterling Electric Motors, Inc., Telegraph Rd. at Atlantic Blvd., Los Angeles 22, Calif.*

# No Solder...Tape ...or Tools!

...FOR PERFECT  
APPROVED WIRE JOINTS



All You Need  
is a Pocketful of  
**IDEAL**



(THE SOLDERLESS, TAPELESS WIRE CONNECTORS)

Patented, No. 1,932,553



For wire joints that you can stake your reputation upon, get IDEAL "Wire-Nuts"! "Wire Nuts" are the easiest way known to connect two or more wires. They make a perfectly insulated joint that is shake proof, pull-proof—actually stronger than the wire itself! Just strip the wires and screw on "Wire-Nuts". Ten times as fast as old-fashioned solder and tape!...when running circuits, hanging fixtures, etc. Make sure you get genuine IDEAL "Wire-Nuts"—the connectors that are fully approved and listed in contractors' sizes 74B and 76B by Underwriters' as pressure cable connectors for general use. "Wire-Nuts" have been first choice of contractors for more than 27 years! Get a supply of "Wire-Nuts" from your IDEAL Distributor today.

**IDEAL FREE SAMPLES**

IDEAL INDUSTRIES  
1041 Park Avenue, Sycamore, Ill.

Please send free sample  
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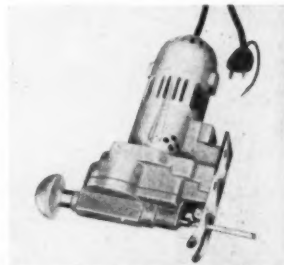
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America's  
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## Instrument Accessories (13)

Two new accessories that can be used with the Amprobe snap-on voltmeter have been developed. One is the Amprobe 10x Sensitizer, which makes possible easier low-current readings. When plugged in between equipment being checked and outlet, it multiplies the sensitivity of the Amprobe by ten times. It has 10 precision windings in one arm, and is made of Bakelite. Capacity is 10 amps for intermittent use, and 2.5 amps for continuous use. The other is the Amprobe split plug accessory of similar construction and appearance, except that it does not have windings to increase the sensitivity. Unit facilities snap-on current readings of equipment having sealed double-conductor electric cord. When plugged in between equipment being checked and outlet, it separates conductors instantly without touching wire. Capacity is 30 amps for intermittent use, and 15 amps for continuous use.

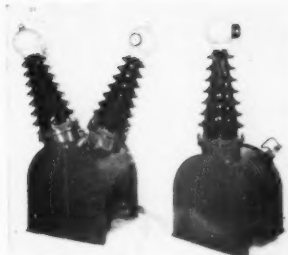
Pyramid Instrument Corp., 49 Howard St., New York 13, N. Y.



## Electric Saw (14)

Announcement has been made of a Whiz-Saw, Model No. 2, portable power tool, a multi-purpose cutting tool for factory, home and shop. It will cut wood, bone, fibre and other composition materials up to 2 inch in thickness. Also when equipped with a high speed blade will cut light gauge metals. It can be used as a rip, cross cut or scroll saw. Weight is 6½ lbs.

Forsberg Mfg. Company, Bridgeport 1, Conn.

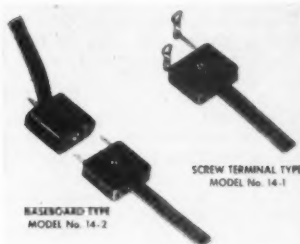


## Transformer

(15)

Announcement has been made of design changes in the single and two-bushing potential transformer (Type SPW). It has a welded heavy gauge steel case, which results in a hermetically sealed unit free from breathing. Core of transformer is made of high permeability cold rolled steel. Electrical coils are protected by corona-free pre-formed angles, channels and barriers of insulating material. Units are available in the 500-volt, 60 cycle, oil-filled class in 24, 34.5, 46 and 69 kv ratings.

Allis-Chalmers Manufacturing Co.,  
930 S. 70th Street, Milwaukee, Wis.



## Connector

(16)

Announcement has been made of the addition of two new types of connectors to this line. One of the units, the No. 14-1, is designed to eliminate the need of cutting the twin line in the middle to insert a connector. Male pins, attached to lugs, mount under the screw terminals of receiver. They can be adjusted to conform with various center to center terminal distances. Receptacle is then attached to the end of the 300 ohm twin line and plugged onto the pins. The other unit, No. 14-2 is a baseboard junction for the twin line lead from the outside antenna and the lead carrying to the receiver and allied equipment. A wood screw holds receptacle to baseboard or other mounting surface. Male plug is attached to end of lead which runs to receiver circuit. Other receptacles can be paralleled.

Grayhill, 4524 W. Madison Street,  
Chicago 24, Ill.

# IDEAL Wiring Tools Speed the Job and Cut Costs!



*Stripmaster*  
(Patented, No. 2,523,936)

## WIRE STRIPPER

Six models handle all wire gauges — 8 to 22 — solid or stranded POSJ and TV twin cable. Blades are interchangeable in all models.

Ends wire waste and damage and prevents cut fingers. A single light squeeze strips wire up to full 7/8 inch. "Automatic" feature positively prevents crushing of wire. Just insert wire, squeeze and release. Jaws then snap back, ready for the next squeeze. Precision built for dependable performance. Weighs just 10 Oz.

## Coil-Flex FISH TAPE

(Pat. Pending)



Pays for itself over and over in time savings! Can't stick or bind in any conduit. Steel spring wound around rust-proof cable goes easily around 90° bends. Factory tested for 400 lbs. pull. 25-foot lengths quickly join into longer tape.

## B-X CABLE CUTTER



Easiest way to cut B-X. Just snip, twist B-X and pull it apart! Cuts two or three-wire No. 10, 12 or 14 armor cable, large or small diameter. Blades removable for sharpening. Cuts anywhere along length of cable.

## CABLE RIPPER



For use on non-metallic sheathed cable or lead covered cable. Cuts cleanly, easily and quickly in one operation. Simply squeeze onto cable and pull.

Graduated holes in cable ripper also serve as wire gauge.

## VOLTAGE TESTER



Not ordinary "glo" type. Actually indicates nominal voltages from 110 to 600 AC or DC. Has BOTH a solenoid voltage indicator on calibrated scale and a neon test lamp. Prods heavily insulated.

IDEAL WIRING TOOLS  
ARE SOLD THROUGH  
AMERICA'S LEADING  
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# The ONLY Soldering Tool You Need for

## light or HEAVY Work!

Switch instantly from light to heavy work—or vice versa—with the 250-watt Weller Soldering Gun. Controlled dual heat makes the Weller Gun the only soldering tool you need for all types of work. 5-second heating saves time and current on every job, too. Your Weller Gun pays for itself in a few months!

### 250-Watt WELLER SOLDERING GUN



#### • TRIGGER-SWITCH CONTROL

Governs heat and saves power because no need to unplug gun between jobs. Heat goes off when you release trigger.

• 5-SECOND HEATING—No waiting, no wasted current. Saves hours and dollars each month.

• SOLDERLITE—Spotlights the work. Lets you see what you're doing at all times, even in dark corners.

• LONGER REACH—Lets you get at any job with ease. Slides between wiring, into the tightest spots.

• STREAMLINED—Compact and comfortable to hold. Pistol-balanced for fast precision soldering.

• WELLERTIP—Rigid and chisel-shaped with more area for faster heat transfer. Over/under terminals brace tip, give greater visibility.

• DUAL HEAT—Single heat 200 watts; dual heat 200/250 watts; 120 volts; 60 cycles.

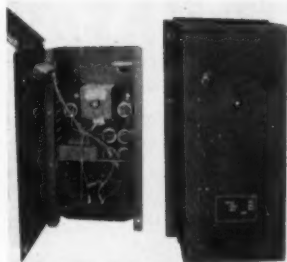
See the all-purpose Weller Soldering Gun today at your distributor—or write for bulletin direct.

**SOLDERING GUIDE**—Get your new copy of **SOLDERING TIPS**—revised, up-to-date and fully illustrated 20-page booklet of practical soldering suggestions. Price 10c at your distributor, or order direct.

# WELLER

ELECTRIC CORP.

815 Packer Street, Easton, Pa.



### Battery Eliminator (17)

Type ZF3DP telephone power supply is designed to eliminate dry cell batteries on private phone systems such as are used in factories, apartment houses, professional and office buildings, and in schools. Power supply consists of a filtered full-wave selenium rectifier. Operation is from 115 volt 60 cycle ac line, with 3 amps dc output capacity. Taps are provided for 8, 10 and 12 volts. Also provided is an 8 volt ac tap for operation of ac buzzers or other equipment. These rectifiers are primarily intended for installation on existing telephone systems using a dry cell battery power.

Electronic Rectifier Co., Inc., Rochester, N. Y.

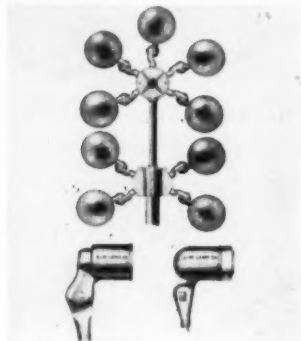


### Radiant Heat Panels (18)

New Electrigras radiant heat baseboard panels have been introduced for prime and supplemental heating of homes, industrial and commercial buildings. Panels are designed to take the place of ordinary baseboard in a house. They are usually recess-mounted in new construction and surface mounted in old buildings. Heating unit consists of an unbreakable glass panel encased in a steel frame with hammered silver finish. A chemical element is fused into back surface of glass, which temperature reaches approximately 240° F. Fully-automatic in operation, panels are used with a low-voltage thermostat and relay in each room, which permits individual room temperature control. Panels are available in two sizes, a

300 watt (1024 Btu) unit 42 inches long, and a 200 watt (683 Btu) unit 30 inches long. Both are 6½ inches in height and 1½ inches deep. Sections are held together by ½ inch conduit nipples, locknuts and bushings.

Appleman Glass Works, Bergenfield, N. J.



### Lighting Unit (19)

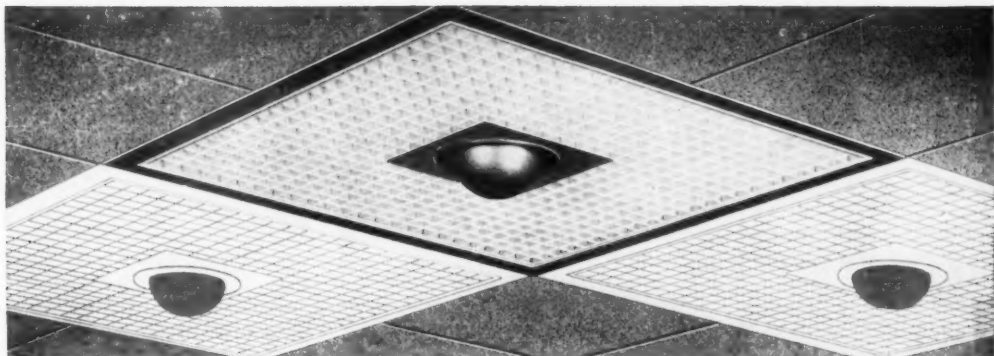
A line of cluster-lites, called "Red Cappers", has been developed. Basic units are medium and mogul base lampholders, a slip-fitter cluster box, and a cluster box. All units are weatherproof. Slip-fitter cluster box has openings on either end, and can be mounted on a 1½ inch or 2 inch pipe. Top cap fits opening not in use. The line offers vertical and horizontal aiming quadrants for cluster lite lampholders.

S & M Lamp Co., Terminal Annex Box 2315, Los Angeles 54, Calif.



**EXIT LIGHT**, known as Light Warden, has been announced. If regular source of lighting power should fail, light will operate instantly and automatically from power furnished by batteries within unit. Emergency feature also furnishes a downward beam to illuminate floor area. Unit will furnish approximately 8 hours of emergency light from a 7½ volt standard dry battery. Manufactured by Electric Cord Company, 30 Church Street, New York 7, N. Y.

# SO EASY to install...to clean...to relamp



—and these are only a few of its advantages!

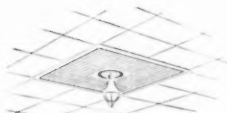
The contractor who *puts in* Skylike® lighting likes its light weight and ease of handling—and the freedom from service call-backs (Skylite is simple in construction, simple in wiring—there are no ballasts, starters, accessories, or transformers to need attention).

The man who *maintains* Skylite likes it because he can relamp it from the floor; and because its enamelled ceiling is readily accessible and cleans easily with a damp cloth.

The man who *chooses* Skylite lighting likes it because he gets the modern appearance of fluorescent-type troffers **PLUS** the many advantages of this new application of the silvered-bowl incandescent lamp:

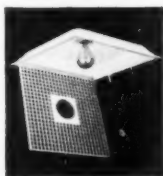
1. High initial and maintained light output.
2. Softly diffused shadows.
3. Low brightness and 90° shielding.
4. No flickering, blinking, or hum.
5. Warm color—most desired by merchandising experts.
6. Instant starting.
7. Variable lamp size—150- to 500-watt.
8. No light loss from darkened walls or ceilings.
9. Floor-service relamping—no ladders or scaffolds.
10. Hermetically sealed silver reflecting surface.

Even with all these advantages, Skylite costs only  $\frac{1}{2}$  to  $\frac{1}{3}$  as much as equipment delivering comparable results! It is versatile in application, too. Units fit 24" x 24" ceiling tiles, fully or partially recessed, or may be surface-mounted—in rows or patterns. With a simple accessory, Skylite converts for directional or accent lighting.



**RELAMP FROM THE FLOOR!** One of the many economies of SKYLITE is its ease of maintenance. No stepladder is needed for relamping—a lamp changer can be used, as shown.

**EASY TO CLEAN**—The 87% reflection factor of SKYLITE's enamelled ceiling is easily maintained by occasional cleaning with a damp cloth.



**SILVRAY**

**Skylite** \*

\*Patent pending



Send coupon for Skylite booklet

Graybar Electric Co., Inc.  
Graybar Building,  
420 Lexington Ave.  
New York 17, New York



Please send me a copy of "Silvray Louvered Incandescent Lighting Systems".

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5108



# Here's Why It's Good Business To Sell "Buffalo" FANS

No chrome plating, no fancy shaped blades—just sturdy, rigid, easy-to-install fans designed to move the most air for the lowest overall cost—that's the reputation "Buffalo" Fans have earned with commercial and industrial users during 73 years. By the same token, that's why "Buffalo" Fans are so easy to sell, and why they **STAY SOLD**, building long-term goodwill for you!



TOP PHOTO—  
"Buffalo" Belted Vent Sets are compact "package" units for quiet centralized ventilation, in moderate sized buildings. Easy to install. WRITE FOR BULLETIN 3720.

LEFT—the very popular and low-priced "Buffalo" Breezo Fan. Nothing flimsy about it. All set for easy installation in wall, where stale air needs to be exhausted. WRITE FOR BULLETIN 3222-F for facts on this and other fast-selling "Buffalo" Fans!

## BUFFALO FORGE COMPANY

520 BROADWAY BUFFALO, NEW YORK  
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.  
Branch Offices in All Principal Cities

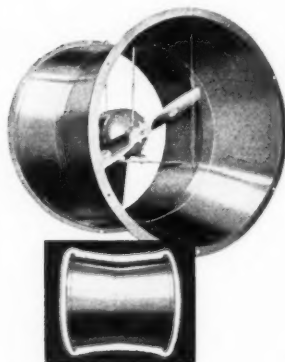
PANEL BREEZO FANS BELTED VENT SETS BELT-AIR FANS  
BREEZ-AIR ATTIC FANS "L" BREEZO FANS "NV" BREEZO FANS



Bail Clamps (21)

Announcement has been made of new bail clamps which prevent damage to conductors. They are permanently installed on main conductor, the tap-off connection being made to the bail of the clamp by means of a hot line clamp or split bolt connector, preventing burning and pitting of main conductor when disconnecting or connecting tap wire. Available with eye nut or with hexagon nut. Furnished in three sizes for copper conductors, 6 solid minimum to 2/0 strand maximum, 2/0 solid to 4/0 strand, and heavy duty clamp for 2 solid to 4/0 strand. Also plated for aluminum conductors for 6ACSR to 2/0ACSR, 2ACSR to 4/0ACSR and 4ACSR to 4/0ACSR.

W. N. Matthews Corp., 3850 Delor Street, St. Louis 16, Mo.

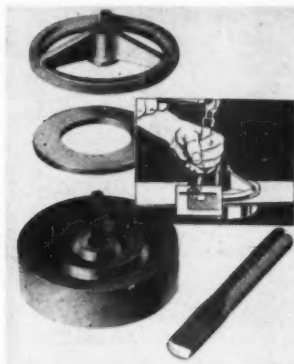


Reversible Fan (22)

A new fan, which is fully reversible, has been announced for industrial uses. It has an air delivery of approximately 20,000 cubic feet of air per minute at free air by a 36 inch single-propeller reversible fan, equipped with a 2 hp motor. Air delivery is identical when fan is re-

versed. Alternate-direction efficiency is accomplished by a specially designed propeller. Fan may be periodically reversed either manually or automatically and provide uniform drying.

*Hartzell Propeller Fan Company, Piqua, Ohio.*



#### Punch

(23)

A new type of tool, known as the "Zing" punch has been announced. It is designed to cut holes in various types of sheet metal. It consists of four parts—the anvil, adapter ring enabling two sizes of holes to be punched on the same tool, the chisel guide and a special shaped chisel. They are made in a large selection of sizes, including models for round holes, square and rectangular holes, and a special tool for forming round holes.

*West Pacific Company, 1825 S.W. 6th Avenue, Portland, Oregon.*

#### Wall Plates

(24)

New chromium finished wall plates to provide a junction facility between lead-in terminal and T-V receiver that eliminates installation of outside antenna lead-in from T-V set direct to roof top has been announced. Plates can be wall-mounted directly in back of or near T-V receiver. Three types are available. Model S-302-WPC with one socket is for use where antenna lead-in only is required; Model S-302-4 has two sockets, one each for antenna lead-in and for rotor leads of Alliance, C & G Tool, Koening, U. S. Devices and all other rotors using two and four wires; Model S-302-8, with two sockets, one for antenna lead-in and one for lead-in of rotor wires of Cornell-Dubilier, Crown, Radiart and other rotors using up to eight wires.

*Cinch-Jones Sales, Division of Cinch Mfg. Co., Chicago 24, Ill.*



## HYDRAULIC KNOCK-OUT PUNCHES are at least 60% faster!

Electricians call this the greatest boon in years! No more sweating it out with a wrench — no more danger of being jolted off ladders and scaffolds — no more distortion of boxes — no more getting stymied by cramped quarters. The hydraulic "Porto-Power" unit and its knock-out punches make clean holes for 1/2" up to 4" conduit . . . and with unbelievable ease! And users are proud of their installations — they punch exactly where the conduit should go for a neat job.



### Porto-Power makes all this possible . . .

All Blackhawk Electrician's Equipment features highly-refined hydraulic units called "Porto-Power." They differ from ordinary jack units because the pump and ram are not in one combined piece. That makes the ram all-directional and especially adaptable to hole punching, pipe bending and allied jobs.

#### ● Bend RIGID and THIN-WALL conduit this better, faster way

Whether hand-operated or motor-driven, Blackhawk Benders roll up bigger profits due to the exclusive "Porto-Power" idea.

● All this equipment pays for itself on the first good job. Write today for full facts!

## BLACKHAWK

Blackhawk Mfg. Co., Dept. P-2011, Milwaukee 1, Wis.  
Rush free catalog on complete "Porto-Power" line for electricians.

Name \_\_\_\_\_  
Firm \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

Buy from leading supply houses. Send coupon for free catalog.



# NEW!

## TURN-TYTE INTERLOCKING DEVICES

Now At Leading  
Electrical Wholesalers

New TURN-TYTE devices are precision made by expert workmen with the finest materials. They require only a slight turn, and are interchangeable with similar devices currently used. All are Underwriters' listed. For catalog and complete details write to Dept. ECM-2.



### Turn-Tyte

**NEW—3 Wire Cord  
Connector Body.**

10A—250V 15A—125V  
Catalog #3100  
20A—250V 10A—575V  
Catalog #3200

Consists of two pieces of molded bakelite. Base is armored and contains a cord clamp. Cord hole, .625; and O.D., 1 1/4". All connector bodies contain bronze contacts mounted on brass terminals to assure positive heat-free conductivity. All metal straps and armor are coated to resist rust and corrosion.

### Turn-Tyte

**NEW—3 Wire Armored  
Caps with Cord  
Clamp**

10A—250V 15A—125V  
Dim O.D. 1 3/4" Cord Hole  
#625 Catalog #1036

20A—250V 10A—575V  
Dim O.D. 1 3/4" Cord Hole #625  
Catalog #1236



### Turn-Tyte

**NEW—3 Wire Re-  
ceptacles (Bakelite)**

10A—250V 10A—125V  
Catalog #1075

20A—250V 10A—575V  
Catalog #1275



### Turn-Tyte

If your regular electrical wholesaler cannot supply you with TURN-TYTE, please write and tell us. We will supply you with the names of the electrical wholesalers in your area who will be pleased to fill your TURN-TYTE needs.



**RODALE**  
MANUFACTURING CO., INC.  
EMMAUS PENNSYLVANIA



## Brackets and Arms (25)

A new line of pipe brackets and mast arms for mounting street lighting fixtures has been announced. Available in both aluminum and galvanized steel models, they are designed to exceed the requirements of NEMA-EEI specifications. Bracket and pole plate are built in one assembly. Installation is made by a keyhole slot in pole plates which enables a lineman to hang assembly on a bolt driven through pole while tightening other bolts. A large radius of bend is allowed for bringing cable through bracket to facilitate wiring and to guard insulation.

General Electric Co., Schenectady 5, N. Y.



## Attic Fan (26)

A new package attic fan has been announced. This vertical discharge unit with built-in suction box measures around 3 feet square and projects 17 1/2 inches above attic floor. It is for use over narrow hallways and in low attics. Installations can be made over kitchen or other rooms, depending on construction. Fan, motor and section box are all in one unit that rests on attic floor. Rubber base provides an air seal and cushion between fan frame and attic floor. Automatic ceiling shutter is operated by a wall switch. Shutter is installed by

attaching to wood frame of ceiling opening. Shutter and trim are finished in light ivory.

Robbins & Myers, Inc., 387 S. Front St., Memphis, Tenn.



## Call Board System (27)

A library reader call board system for use in school and public libraries has been announced. System consists of two units—a numbered indicator panel mounted in full view above librarian's check-out counter, and a toggle switch panel located on or adjacent to counter within reach of librarian. When a book is ready to be picked up, the librarian throws the numbered switch corresponding to the number previously given to a borrower. This illuminates the number on the indicator panel, which remains lighted until borrower calls at desk for book. Several styles of indicators and methods of mounting are available.

Auth Electric Company, 34-20 45th Street, Long Island City 1, N. Y.

## Control (28)

Announcement has been made of new delayed action photoelectric control set PID, which has been designed to indicate the presence of the jamming of cases or cartons on conveyor lines. It combines a high speed photoelectric circuit with an electronic delayed action timer in a single control to limit relay action to those occasions when a jam occurs. Relay operates only when the light beam has been broken for a preset time interval representing a period longer than that normally required for a case to pass. Delayed action is adjustable from 1/20 second to 5 seconds. It operates on 115 and 230 volts, 50-60 cycles, ac.

Photoswitch Incorporated, 77 Broadway, Cambridge 42, Mass.

**SPECIFY DAY-BRITE WITH CONFIDENCE**

**INSTALL DAY-BRITE WITH CONFIDENCE**

# DAY-BRITE QUALITY MEANS NO WORRIES

**IT HAPPENS INVARIABLY.** You're uneasy about fixture "X." Its ballast is questionable. In several places, construction is skimpy. But, maybe—just maybe—this time you'll be lucky. You go ahead with fixture "X."

**BUT, SURE ENOUGH . . .** the temperamental fixture skyrockets installation time. Your profits dwindle to a whisper. Then, add an irate customer . . . time and money lost in call-backs . . . and you're fed up with the whole electrical business.

**THE ANSWER IS DAY-BRITE.** No worries. No doubts. Every inch of every Day-Brite fixture is engineered and constructed to deliver fast, simple installation, lowest-cost maintenance and quality performance.

**KEEP YOUR PROFITS.** Keep your customers. Keep your peace of mind. Specify and install Day-Brite with confidence. You can't make a sounder "better business" policy.

**"DECIDEDLY BETTER"**  
**DAY-BRITE**  
*Lighting Fixtures*

Day-Brite Lighting, Inc., 5402 Bulwer Ave.  
St. Louis 7, Missouri

In Canada: Amalgamated Electric Corp., Ltd.  
Toronto 6, Ontario

**DISTRIBUTED NATIONALLY BY  
LEADING ELECTRICAL WHOLESALERS**

## THE NEW DAY-BRITE "LUVEX" SLIMLINE FIXTURES

All-metal, shielded, for two 96" T-12 Slimline lamps . . . continuous or unit installations . . . suspension mounting only.

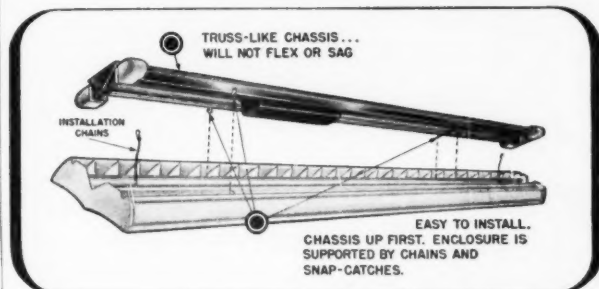
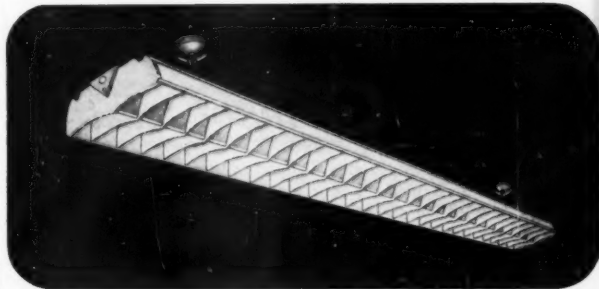
### CHASSIS

Rigidly engineered—no sagging—no flexing. Finished in HOT-BONDED SUPER WHITE enamel. Instant-starting HPF, 430 milliamperes ballasts. Bushed openings in ends of chassis for through feed.

**GET ALL THE "LUVEX" FACTS. WRITE TODAY FOR BULLETIN 10-M.**

### ENCLOSURE

Enclosure and louvers completely interlocked at all points, resulting in a rigid, one-piece unit. Finished in HOT-BONDED SUPER WHITE enamel. Amazingly simple, low-cost maintenance.



2-WAY CHOICE of operating method greatly increases utility of Ramset Dual-Action Tool for instantaneous fastening into steel or concrete — with just a TURN... or a TAP.

ALL-STEEL CONSTRUCTION, of extra thick, precision machined, aircraft quality steel, adds years of economical, dependable performance.

NEW ROTO-SET SAFETY SHIELD adjusts in ten seconds to any of seven positions; permits easiest, most accurate positioning of fasteners.



## FASTER, EASIER FASTENING with improved *Ramset* Dual-Action

You'll be time and money ahead, using RAMSET SYSTEM for fastening work in steel, concrete, masonry. Cutting time by as much as 90%, and costs by as much as 75%, RAMSET pays big dividends to thousands of users. With the improved RAMSET DUAL-ACTION TOOL, benefits are greater than ever before.

### Ask for demonstration on your own work

Your local Ramset Specialist will "Ramset" a sample job for you, without cost or obligation. He'll show you the wide line of RAMSET FASTENERS, engineered to meet your most exacting needs. He'll prove Ramset's economy, speed and convenience on tough or easy fastening jobs. And, he'll help you find the surest, fastest, lowest-cost methods of doing especially unusual work. Ask for details and proof. *Ramset Fasteners, Inc., 12117 Berea Road, Cleveland 11, Ohio.*

**Ramset Fastening System**  
*Pioneer in powder-actuated fastening*



### Multiple Unit Signal (29)

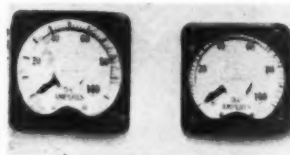
A new back-lighted multiple unit signal has been developed for application as a trouble signal in process industries and power plants. It may be used to detect off-normal operation of any type of equipment. It is a hermetically sealed unit which conforms to code regulations for Class 1 Division 2 specifications. Combining signal lights and relay in a single sealed container, the signal forms a one-piece unit that plugs into a universal chassis. Cabinets may be obtained with any number of alarm units depending on requirements of each individual user.

*Panalarm Products Co., 7218 No. Clark St., Chicago 26, Ill.*

### Bender (30)

An improved Handy pipe and tube bender for conduit, iron and steel pipe, brass, copper, and aluminum tubing has been announced. It can be used as a portable tool or bolted to a bench or pipe vise. It is made to fit outside diameters of tubing. Standard bender is recommended for soft tubing or short runs of hard-temper tubing. The heavy duty one is recommended where most work is done in hard temper, heavy steel or iron pipe.

*Holsclaw Bros., Inc., Evansville 11, Ind.*



### Instruments (31)

New Full-View Type K-24 circular scale switchboard instruments are now available. Featuring a new dial and cover structure, they provide maximum readability from the steepest angles and cause no objectionable shadows on scale, even under adverse lighting conditions. Design is the same as the



original Type K-24 except for cover and dial. Drilling plan for the two types is identical, and they can be used interchangeably. Original Type K-24 instruments can be converted to Full-View type by replacing dials and covers.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.



**Instruments**

(32)

A new line of 8½ inch, long-scale switchboard instruments, designed primarily for applications where long-range readings must be taken, has been announced. Designated as Types AB-16 (ac) and DB-16 (dc), they employ 250-degree scales 14.2 inches long for legibility. Scale is mounted flush with front of case, a protruding convex-type glass cover providing clearance for both scale and pointer. Suitable for use on swinging brackets or other installations remote from control station, instruments are housed in dustproof, moisture-resistant cases, designed for semi-flush mounting. All instruments are equipped with shock-resistant bearings.

General Electric Company, Schenectady 5, N. Y.

**Slot Insulation**

(33)

Varslot is a new combination slot insulation for armatures and stators. It is made from 100% rag paper combined with "Vartex" black bias varnished cambric. It is available in slot insulator styles and standard rolls or sheets. Insulators are fabricated, ready to be inserted into slot. Varslot has a dielectric strength of approximately 600 volts per mil. Yellow or black Varslot is available in standard 36 inch by 36 inch sheets or 36 inch wide rolls, as well as in special size sheets and rolls.

Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago, Ill.

## THIS FULLY ILLUSTRATED BULLETIN, IN COLOR, TELLS ABOUT **POWERSTAT** LIGHT DIMMING EQUIPMENT



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CONTROL FOR  
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The dimming, brightening and blending of illumination is becoming more and more important in the design of new buildings and the remodeling of existing structures. In Bulletin 749 you will find equipment applicable to any job. All POWERSTAT Dimmers carry Underwriters' Laboratories Approval; are available in numerous models and ratings in capacities from 1000 to 30,000 watts.

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Please send me Bulletin 749 on POWERSTAT Light Dimming Equipment.

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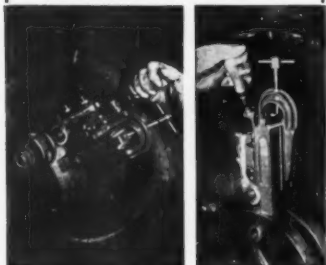
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## MARTINDALE COMMSTONE HOLDERS



Hold Commstones rigid and true for concentric resurfacing of commutators and slip rings while running at normal speeds in their own bearings. Interchangeable boxes 1", 2" and 3" wide handle grinding jobs up to 4 1/2" wide.

### SLOTING FILES



Rapidly undercut mica, leaving a V-shaped slot. Made in five sizes.

### ARMATURE WEDGE REMOVER



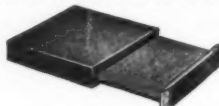
The coarse teeth on this tool bite firmly into wood and fibre wedges and save time in removing them quickly.

### WEDGE DRIVER



Has outer shell made of brass to avoid rust. Driving pin made from steel.

### STANDARD TAMPING TOOL



Available in three sizes



Write for 64-page catalog of Martindale Maintenance and Production Equipment  
**MARTINDALE ELECTRIC CO.**  
1309 Hird Ave. Cleveland 7, Ohio



### Capacitor

(34)

A new electrolytic motor starting capacitor has been introduced. Known as Type ETB, it is small enough to be tucked away in motor end-bell or base. Aluminum container measures 1 1/4 inches in diameter and 2 3/4 inches in length. Insulating tube adds 1/8 inch to diameter and 1/8 inch to length. It will operate on 110 volts, 60 cycles intermittently and is rated at a maximum of 60 one-second starts per hour. It is also used for low-voltage sub-fractional capacity start, capacity run motors where operation is intermittent and where voltage across capacitor does not exceed 45 volts.

Cornell-Dubilier Electric Corp., South Plainfield, N. J.

## Product Briefs

(35) All-State Welding Alloys Co., White Plains, N. Y., has announced an improved aluminum **solder flux** that can be reactivated after drying out by the addition of tap water. . . . (36) Kuhlman Electric Company Bay City, Mich., has announced Perma-Kuhl, a new **inhibited oil**, to be furnished with all the company's distribution and power transformers.

(37) Sensitive differential static pressure or vacuum **control** is an addition to the series manufactured by Coral Designs, a division of Henry G. Dietz Company, Long Island City, N. Y.

(38) Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has announced extension of ratings of its high voltage air **contactor** line for general ac motor control applications up to 2,500 hp at 5,000 volts, or 3,000 hp. at unity power factor. . . . (39) New dual 300/600 and 400/800 ampere selenium rectifier dc **welders** are available from Westinghouse Electric Corp., Pittsburgh, Pa.

(40) Westinghouse Lamp Division, Bloomfield, N. J., has announced a new sealed beam type **lamp** for use in all-weather electric lantern. . . . (41) G & W Electric Specialty Company, Chicago, Ill., has announced pole-top mounting of Type "RA" load break oil

**switches** for direct connection to overhead circuits. . . . (42) Reed Research, Inc., Washington, D. C., has developed a **recorder** that furnishes 30 channels of information in the space required for one normal wide-chart recorder.

(43) Formica Co., Cincinnati, Ohio, has announced a new **insulating material**, known as Z-80, designed especially for 60 cycle work. . . . (44) An improved line of standard duty **speed reducers** have been announced by Cone-Drive Gears, Division of Michigan Tool Co., Detroit, Mich. . . . (45) The Cyclohm Motor Corporation Division of Howard Industries, Inc., Racine, Wis., has announced that its new fractional hp **motor** model 2900 is now being manufactured as a 2-speed Hysteresis motor for use in tape recording applications.

(46) An externally-mounted water heater **thermostat**, known as Model C Clostemp, is available from the Westinghouse Electric Corp., Pittsburgh, Pa. . . . (47) A new Con-L-Duit shoe **collector** has been announced by Calabar Corp., South Gate, Calif. . . . (48) A 50-foot steel tape **rule** which rewinds automatically has been developed by Master Rule Manufacturing Co., Inc., Middletown, N. Y.

(49) Barry Corporation, Cambridge, Mass., has announced a new series of vibration **isolators** for unusual airborne applications. . . . (50) Walter Haertel Company, Minneapolis, Minn., has announced a new junior commercial and industrial **dehumidifier** "50". . . . (51) Lima Electric Motor Company, Lima, Ohio, has announced a new 6-inch Model A deluxe utility **grinder**.

(52) Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has announced a new outdoor current **transformer** designed for versatility in mounting.

## CATALOGS and BULLETINS

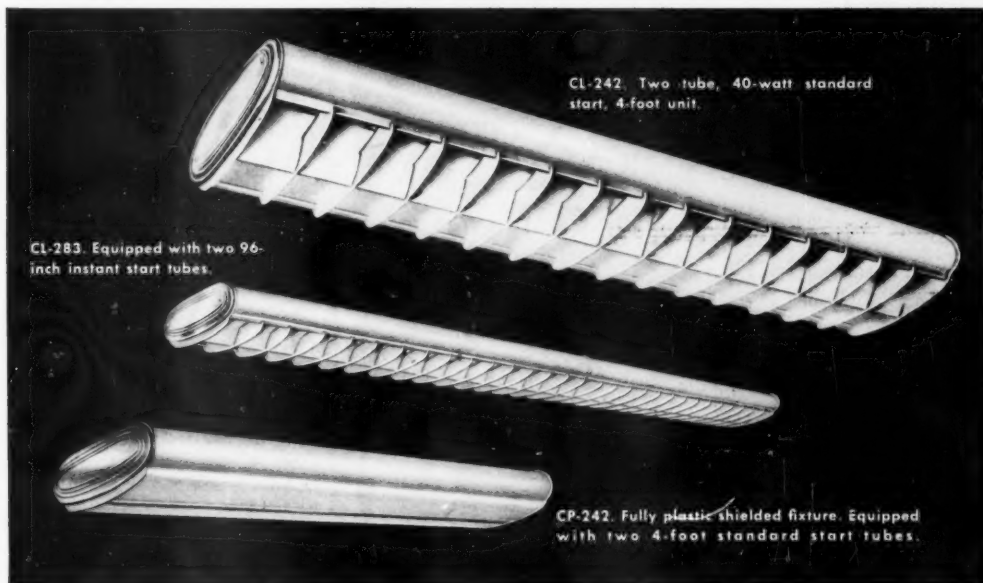
(53) COLD CATHODE Lamps and fixtures are discussed and illustrated in 4-page folder A-5010. Colonial Electric Products, Inc.

(54) PRICE SHEETS and descriptive information on switch boxes, outlets, bar hangers, connectors, entrance fittings, bushings, and conduit accessories are numbered SB, OB, BC, EF, OF, LB, OT, CF, TW and GF. Ap-leton Electric Co.

(55) SOLDER for radio and electronic work, non corrosive and non conductive, is specified on file sheet 12C. Anchor Metal Co.

**A COMPLETE line of COMPLETE fixtures...**

# **COMPLETELY GUARANTEED BY SYLVANIA**



CL-283. Equipped with two 96-inch instant start tubes.

CL-242. Two tube, 40-watt standard start, 4-foot unit.

CP-242. Fully plastic shielded fixture. Equipped with two 4-foot standard start tubes.

## **See why Sylvania's new Trimline Series means big savings for contractors**

You'll win customers' approval... save time and money too... when you install Sylvania's new Trimline Fluorescent Fixtures.

Here are 13 coordinated fixtures of highest possible quality. Designed to meet any commercial lighting need. Each fixture is complete with starters, ballasts, and tubes. No time lost shopping for parts. No wiring on the job.

In addition, these Sylvania fixtures are easy to install. Quickly surface or pendant mounted. Joined in continuous rows by simply fitting and fastening 2 end plates.

On every installation of 25 or more Trimline fixtures, Sylvania backs you up with the most complete guarantee in the fluorescent lighting field.

### **FULLY GUARANTEED**

This guarantee covers fixtures, tubes, sockets, ballasts, starters, and all other parts for a period of one entire year.

Get complete details from your regular distributor about the money-saving advantages of Sylvania's Trimline fixtures. If he can't give you all the facts, mail the coupon today.

FLUORESCENT TUBES;  
FIXTURES; SIGN TUBING;  
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BULBS; RADIO TUBES;  
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# Latrobe

## PRODUCTS

★ FLOOR BOXES ★

★ WIRING SPECIALTIES ★



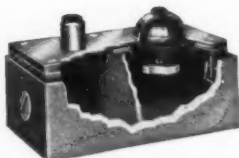
### "Latrobe" Products Cut Time and Labor Costs

"Latrobe" Floor Boxes and Wiring Specialties are simply and compactly designed for speedy installation and smooth, effective service. The ease with which "Latrobe" Products are installed results in tangible dollars and cents savings over similar products.



No. 170 "Latrobe"  
Pipe or Conduit Hanger

Convenient and dependable for hanging pipe or conduit  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1" to steel beams up to  $\frac{1}{2}$ " thick. Permits pipe to run at any angle to the beam.



No. 252-R Two Gang  
Adjustable Floor Box

Neat and practical with No. 208 Receptacle in one section. One Cover Plate has  $\frac{1}{2}$ " flush brass plug; other has 2".



No. 150 Floor Box,  
No. 207 Nozzle

Soundly constructed with  $\frac{1}{2}$ " Cover Plate and large Adjusting Ring No. 215. Can be very quickly installed.



No. 280 Nozzle,  
No. 200 Cover Plate

Has 10 Amp. 250 Volt Receptacle in Brass Housing, mounted on  $\frac{1}{2}$ " brass pipe extension 3" long. Longer extension if desired.



"Bull Dog"  
Insulator Supports

Safe and sure for clamping porcelain or glass insulators to exposed steel framework. Four sizes.



Keystone Fish Wire

Made of finest grade flat steel wire properly tempered to give the desired stiffness and springiness. 10 sizes in 100, 150 and 200 ft. coils.

Sold Only Through Wholesalers

**FULLMAN MANUFACTURING CO.**  
LATROBE . . . PENNSYLVANIA

(56) DISCONNECTING SWITCHES, both indoor and outdoor, are described in 8-page booklet discussing design, selection and application data. Westinghouse Electric Corp.

(57) REMOTE CONTROL WIRING is discussed in the form of a picture-story for consumers in an 8-page non-technical booklet 16-330, and comprehensively explained with information on uses, components, circuit diagrams, installation methods and specifications in a 32-page booklet 16-200. General Electric Co.

(58) INDUSTRIAL luminaire, providing both direct and indirect lighting with a 65-degree cutoff angle, open design for maintenance facility and side panels for decorative adaptations, is presented in bulletin 2414. Curtis Lighting, Inc.

(59) SLOT INSULATION for armatures and stators with high dielectric strength, flexibility and toughness is subject of 4-page folder. Insulation Manufacturers Corp.

(60) RELAYS, shaded pole motors and timers are contained in 24-page catalog 109 with charts, diagrams and technical data. LaGrange and Garrison, Inc.

(61) DRILL CHUCK of keyless self-centering design is presented in 4-page folder. Leo Hjort Co.

(62) MULTI-POLE SWITCHES of rotary, tap and transfer design, are subject of catalog 1950-JR containing sectional cutaway and exploded views to reveal details of switch design. Electro Switch Corp.

(63) SILASTIC TAPE, Type R. Class H, with application and technical data, is discussed in 2-page bulletin. Insulation Manufacturers Corp.

(64) INSULATING COMPOUNDS, thermosetting baking varnish, oxidizing air drying varnish and insulating enamel are discussed in series of file sheets containing specifications, electrical and chemical properties, description and application recommendations of Dolflex CC 1010 and Synthite BC 320, AC 25 and ER 19. John C. Dolph Co.

(65) FACTORY LIGHTING fixture for 2, 3 or 4-lamps, with facilities for stem or chain suspension of either individual or end-to-end units is discussed in bulletin 104FL. Fluorescent Fixtures of California.

(66) WELDING MANUAL including the latest developments in welding ma-

terials and techniques, nomenclature, design information, alloy selector chart, inspection and control, is a pocket-sized 48-page booklet. Eutectic Welding Alloys Corp.

(67) **MOTOR GENERATOR** 8-page booklet GEA 5506 covers sets from 30- to 8000-kw, describes construction features of synchronous motors and dc generators. General Electric Co.

(68) **CLUSTER FLOODLIGHTING** for gas stations, signs, sports and commercial applications, using a variety of boxes, lamp holders and reflectors, is discussed in 4-page bulletin F700-50. S & M Lamp Co.

(69) **TANK CONTROLS**, float switches, timers, selectors and alarms are specified and priced in 6-page bulletin CP4. Automatic Control Co.

(70) **FLUORESCENT** 2- and 3-lamp general-line and slimline units with louvered or lensed bottom panels and provisions for surface- or suspension-mounting are specified and priced in AIA File 31F2. The Miller Co.

(71) **LOW SPEED SYNCHRONOUS** motors is subject of 2-color 4-page bulletin 44-200. The Electric Products Co.

(72) **ELECTRODE GUIDE**, 52 pages, pocket sized describes wide range of electrodes in tabbed easy-to-find binding. Harnischfeger Corp.

(73) **RURAL SUBSTATIONS** built from standardized components are presented in booklet B4697 with pictorial illustrations, basic layouts, symbolic diagrams and typical bills of material dimensions. Westinghouse Electric Corp.

(74) **SWITCHGEAR**, both indoor and outdoor for control and better protection of power and distribution circuits, with removable or stationary circuit breakers, is explained in bulletin 18B6185A. Allis-Chalmers Mfg. Co.

(75) **CONTROLS** for temperature, pressure and humidity, using self-actuated, electric and pneumatic automatic principles, are explained in terms of design, application and function in booklet F4365. Barber-Colman Co.

(76) **MERCURY PLUNGER** relays are diagrammed, sketched, priced and specified in 4-page folder. Ebert Electronics Corp.

(77) **AMMETER**, pocket-sized snap-on type, is discussed in 14-page manual

YOU NAME THE PIPE SIZE...UP TO 12"

**TOLEDO**

will thread it at

**LOWER COST!**



Pick a winner every time—insist on genuine **TOLEDO** Pipe Tools for the job! These are the tools preferred for nearly half a century by better mechanics...and used so widely today to thread, cut and ream pipe at top-speed...with less effort...and lower cost.

Your choice—a complete range of 29 quality-built **TOLEDO** tools for all pipe sizes,  $\frac{1}{8}$ " to 12", and  $\frac{1}{4}$ " to 1" bolts...also high-production power pipe machines, up to 2" and 4" capacity...and portable power drives. Get time-proven **TOLEDO** advantages for every pipe fitting requirement! Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

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**POWER DRIVES...PIPE TOOLS...POWER PIPE MACHINES**



Horizontal or vertical discharge at ceiling level

Built-in conduit box

**MODEL 2501**

Motor disconnect plug

Motor completely outside greasy air stream

Squirrel cage blowers

Quiet air inlet

Easy to remove and clean — no tools required

Attractive rectangular grille with dripless bars

**ONLY THE  
TRADE-WIND  
CLIPPER  
HAS ALL THESE  
ADVANTAGES**

**F**OR the best method of ventilating kitchens, bathrooms, laundries, dens or other small rooms specify and install the Trade-Wind Clipper. This proven ventilator is the only small room unit that gives the home owner every worthwhile advantage.

Squirrel cage blowers, accepted and used in air conditioning systems and for forced air heating, are used exclusively in the Trade-Wind Clipper. This forced air discharge, located at the ceiling, traps all unwanted air and expels it instantly. Trade-Wind also has located the motor completely outside the greasy air stream. The motor stays clean indefinitely — requires far less service — and is guaranteed for 3 years. No other small room ventilator combines all these outstanding advantages. In addition, Trade-Wind Clippers are easy to install — they are competitively priced\* — and they make every new owner another salesman for the Trade-Wind line.

Get the complete story from your local supply source, or mail the coupon today.

\*Important price reduction has just been made on Model 2501.

#### MAIL THE COUPON TODAY

**TRADE-WIND MOTORFANS, INC.**  
5709 S. Main St., Los Angeles 37, Calif.

Please send me the complete story on the Trade-Wind Ceiling Ventilator.

Name \_\_\_\_\_

Address \_\_\_\_\_

110 containing technical information, operating instruction and simple adjustments. Pyramid Instrument Corp.

(78) **CLEANERS** that blow, spray, dry and vacuum, in both hand and tank models, are discussed in illustrated mailing piece. Ideal Industries, Inc.

(79) **LIGHTING SYSTEM** of ten new 2-lamp luminaires called the Mid Century line, combining translucent plastic side panels, new reflector designs and streamlined chassis, is presented in bulletin 399. Mitchell Mfg. Co.

(80) **ELEVATORS** for passenger service in stores, offices, hotels, apartment buildings and hospitals, are discussed in 54-page booklet B4572 containing information on selection, types of control, layouts, modernization, component parts and maintenance hints. West-ighouse Electric Corp.

(81) **ELECTRICAL FITTINGS**, including solderless wire connectors, cable and conduit fittings and wiring devices, are presented in catalog 1050. Buchanan Electrical Products Corp.

(82) **TRANSFORMER** bulletin, featuring safety and economy, discusses a 1000-kva unit substation. Marcus Transformer Co., Inc.

(83) **HAND TORCHES** for gas welding and cutting are explained with the use of extensive charts and cutaway views of component parts in reference book ADC702. Air Reduction Co.

(84) **INSTRUMENTS**, including recorders, controllers, indicators, controls and combustion safeguards, are priced and described in bulletin Z6600. Wheelco Instruments Co.

(85) **DIFFUSE** fluorescent luminaires for general shielded and unshielded applications are presented with candlepower distribution curves, construction highlights and mounting details in bulletin AL-A 2-4. Metalcraft Products Co., Inc.

(86) **NUTS** and shakeproof lock washers for many applications where vibration is a problem, are discussed in 2 new 2-color booklets. Shakeproof, Inc.

(87) **TOOLS** and products for maintenance, production and construction, including soldering tools, abrasive stones, fuse reducers, mica undercutters, insulation testers, joist borers, etc., are presented in 35-item 2-color folder. Ideal Industries, Inc.

(88) **SQUIRREL CAGE** 2-pole induction motors are described with cross sec-

tion views showing construction of windings, bearings, rotor and stator, ventilation and mounting features, in bulletin 05B7550. Allis-Chalmers Mfg. Co.

(89) **HAND TRUCKS**, both 2- and 4-wheel, with various rack arrangements, capacities, body styles, wheel construction and accessories, are described in bulletin 9-50-30. Lewis-Shepard Products Inc.

(90) **CARGOLITES** for use in yards, on docks, construction projects and storage areas, using lamp sizes from 60- to 1000-watts in various combinations, are specified in file sheet 129-51. Steber Mfg. Co.

(91) **SOUND REPRODUCTION** equipment, including high fidelity co-axial speakers, tweeters, filters and frequency dividing networks, is discussed in 2-color bulletin 44N26. University Loudspeakers Inc.

(92) **PHASE SEQUENCE** indicator data, in 2-color file-sized bulletin 7A, is published by Associated Research, Inc.

(93) **REFLECTORS**, sockets, holders and accessories for commercial, industrial and floodlighting are contained in catalog and handbook released by the Jones Metal Products Co.

(94) **PRICE SHEET** for wiring, extension cord and store room reels, wire meters, joist borers and knockout trimmers is available from Hykon Mfg. Co.

(95) **SAFETY BELT** bulletin CF26 describes equipment recommended for linemen, structural workers and general duty. Mine Safety Appliances Co.

(96) **FLOODLAMPS** of inside-silvered weatherproof design in 200-, 300-, 500- and 1000-watt sizes, are specified and candlepower-curved on bulletin sheet 80. Radiant Lamp Corp.

(97) **SEMI-DIRECT** slimline 2-lamp luminaires in the Dreadnaught series are presented in bulletin DR2. Metalcraft Products Co., Inc.

(98) **DATA SHEET** for welding rods for high strength results is available from Eutectic Welding Alloys Corp.

(99) **LIGHTING RECIPES** for improving residential illumination, with simple instructions for using existing lamps and light sources to obtain correct illumination, are contained in a 30-page booklet, "See Your Home in a New Light." General Electric Co.



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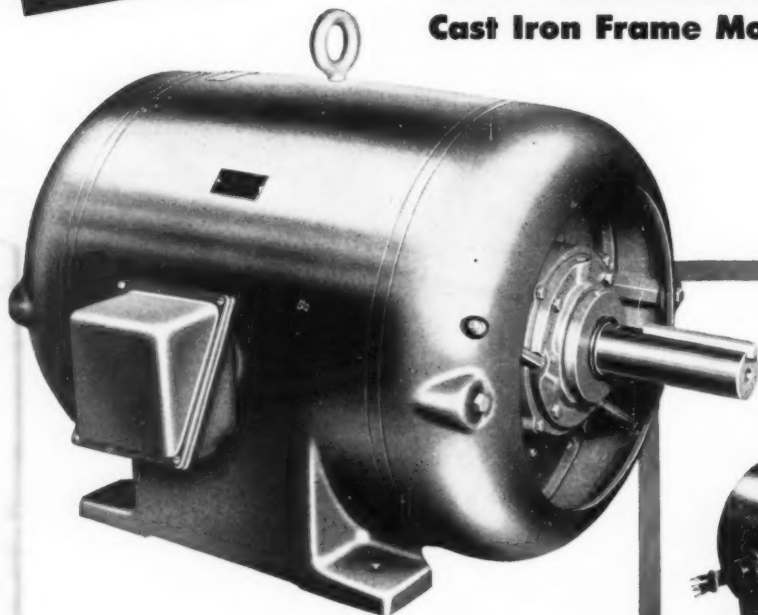
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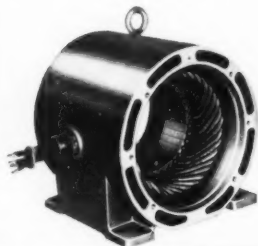
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# Reader's Quiz

## Preserving Buried Conduit

**QUESTION J-17**—What is the best way to preserve buried conduit? In present shops, I find underground conduit that has been deteriorated completely in places, causing burned out feeders due to short circuit. This conduit was below the concrete imbedded in clay soil. In conduit work running from outlet to outlet, or switch to outlet underground, how can you eliminate moisture within the conduit? From my experience, moisture is created when a conduit is run underground to any service above the floor level. On some of the jobs, a drain hole can be used to rid the conduit of moisture, but in shops with no basement, this is not practical.—E.S.H.

**ANSWER to J-17**—Exterior deterioration of underground conduits can be prevented by coating with a hot tar or asphalt paint prior to installation. This will form a protective coating against both acid soil conditions and electrolysis.

The formation of water in underground conduits is usually caused by condensation of moisture in the air which is circulated through the conduits due to change of atmospheric pressures within and outside of the structure. If these conduits are properly sealed with a good grade of sealing compound at both the inside and outside terminals, this will prevent the circulation of air and the resulting condensation of moisture. This condition will prevail between rooms in the same building as well as between the inside and outside of the building.—M.C.R.

## Vibration

**QUESTION K-17**—One of our customers has a 104 hp. 1170 rpm., 2200 volt slip ring, wound rotor induction motor that has a very high speed vibration in it. The vibration is so fast that it would seem as if it were a frequency vibration though it persists for some time after the switch is cut. Please suggest what to look for.—D. M.

**ANSWER to K-17**—The cause of high speed vibration as described in your question is probably mechanically unbalanced rotor. Vibrations of such nature will prevail until critical speed is passed even after switch is open.

To remedy this situation, you should dynamically balance your rotor on balancing machine which can be found in many good shops.—W.J.P.

## Compound Wound Motor

**QUESTION L-17**—We have a 25 hp., 250 volt direct current compound wound motor operating a screw conveyor. For no apparent reason this motor will suddenly run away and begin sparking at the brushes. We have found that the way to prevent this condition is to keep the commutator covered with a heavy wax film or even to throw dust on it. What could cause this motor to act in this manner?—W.P.R.

**ANSWER to L-17**—Your trouble is caused by an open or high resistance circuit in shunt field. This causes the motor to operate as a series motor. By putting wax or dust on commutator you are limiting the current which in turn limits the speed and reduces sparking. Suggest that you inspect all connections in shunt field circuit (both internal and external) including rheostat if one is used. Isolate entire shunt field circuit and connect to an ohmmeter or some low voltage indicating device then wiggle leads and rheostat to check for loose connections.—J.F.R.

**ANSWER to L-17**—There are several possible causes for your trouble, but the most likely is that you have the motor fields connected in differential, that is, the series portion of the field is so connected that it generates a flux in opposition to that of the main field. At light loads, this would have little effect on speed, but as the load increases the current through the series field increases, further weakening the total field, causing the motor to increase in speed, which increases the armature current, weakening the total field still further. This causes an abnormal increase in armature current with excessive arcing at the brushes.

Adding wax to the commutator as you have done would limit excessive currents, by increasing the resistance between the brushes and the commutator. However, it is not good practice to put oily or abrasive substances on a commutator, as it should be kept clean at all times.

To check the connections of the motor you have described, first disconnect your shunt field, then jog the motor with only the series field connected. If the direction of rotation is incorrect, change the series leads to get proper rotation. Then connect the shunt field for the same rotation and you will have an accumulative connection. This will give you more stable operation and better commutation. The motor will have a slight tendency to decrease in speed when the load increases.—W.M.M.

## Magnetic Parts

**QUESTION M-17**—Why do some magnetic parts such as ignition coils have no iron return path when nearly all power equipment such as motors or transformers always have a closed (or nearly so) iron magnetic circuit?—P. S.

**ANSWER to M-17**—When the circuit of an ignition coil is opened, it is desirable to have the flux decrease to zero as quickly as possible in order to produce as high a value of emf as possible in the secondary winding. Iron in the circuit would retard the rate of decrease of flux and the emf would be less. A high value of emf is the primary objective and efficiency is of minor importance in ignition coils, whereas the reverse is true of motors and transformers.—G. L. P.

**ANSWER to M-17**—There are several points to be considered and it may be seen that the iron return path may be replaced with one of air.

One of the first reasons in this case is the low cost possible in constructions utilizing an air return path for the magnetic flux. In this equipment the flux path may be made up of iron, or iron and an air gap. The saturation of the magnetic circuit to a certain density will require a number of am-



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pere-turns, depending upon the length of the magnetic circuit and the respective lengths of iron and air paths.

Efficiency in units that operate intermittently is not of primary importance, as it is relatively simple to compensate for an inefficient (i.e., one with a long air gap), magnetic circuit by adding more magnetizing turns, according to well-known formulas for these calculations.

The final consideration in apparatus such as ignition coils, is that of insulation of the high secondary voltage, from the primary and the core. A simple iron core with an air return path for the flux adapts itself conveniently to excellent insulation of commonly found voltages of 10,000 to 20,000, as primary from secondary is the main insulation problem; exterior points to protect are important but do not influence the design factor under consideration.—L. N. W.

## Ignitron Tubes

**QUESTION M-16**—We have several resistance welding machines that are provided with ignitron contactors and electronic heat controls. Sometimes we have trouble with these welders and after getting them back into operation we are not sure if the ignitron tube was the trouble or not.

Due to the expense of these tubes, we do not like to scrap them without knowing with some certainty that they are in bad order. We would appreciate very much any information as to some simple means with which we could test these tubes, and the equipment, such as meters and circuits we might need. We use both A & B ignitrons. —D.R.M.

**ANSWER to M-16**—Here are a few hints that may help on the question of ignitrons.

1. If the 6 amp. fuse on the ignitor circuit blows out repeatedly, this will indicate a hard starting tube and tube should be replaced.

2. Take an ohmmeter and attach one test lead to the ignitor and another test lead to the cathode. If the ohmmeter reads less than 5 ohms or more than 150 ohms, the tube should be replaced.

3. If the tube glows without being ignited, this indicates a gaseous condition and should be remedied by tube replacement.

4. To find out if a tube is gaseous, that is foreign gases caused by a leaking tube, you may use a high induction spark coil by placing one lead on the cathode and the other lead on the anode. The anode should be disconnected from the line and the lead



should be brought down to within an inch of the tube. If the tube glows, or a spark goes from shell to anode, the tube should be replaced.—P.J.L.

## Voltage Correction

**QUESTION N-16**—If someone should connect a lamp between 1 lead of a 120 240 volt single phase system and 1 lead of a 3 phase 240 volt delta system, then a second person would connect a voltmeter between the remaining single phase lead and another 3 phase lead, would the voltmeter read about 416 volts for the combination open and closed delta connection?—H. S.

**ANSWER to N-16**—I interpret the question to mean that two separate systems are involved and the two leads of the single phase system to which connections are made are the ones between which the voltage reads 240 volts.

The connections result in completing a loop with the two different phase windings, the voltmeter and the lamp in series.

The voltmeter will read full voltage due to the fact that the resistance of the voltmeter is much greater than the lamp resistance.

Since connections are made to two different systems, without making an actual test, it is impossible to tell the phase relation between the two generator windings as they might be in phase and additive to the voltmeter reading 480 volts, in phase and bucking the voltmeter reading zero volts, or might be any angle with respect to each other.

The only case when the voltmeter will read 416 volts is when the two windings are 120 degrees apart.—B. A. S.

## Static Causes Trouble

**QUESTION L-16**—Several belted machines in the plant have been found with pitted bearings. Some were motors; some were other equipment. The first thought was that the pitted condition was due to corrosion, but someone said it was probably due to electricity on the rotating parts. Please give more information about what is probably happening and what can be done to correct the trouble.—L.R.B.

**ANSWER to L-16**—Mr. L.R.B. should run a mechanical ground through his plant and have all ends grounded securely, preferably to water pipes where

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No. 502



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Multi-Part Pin Type  
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No. 261



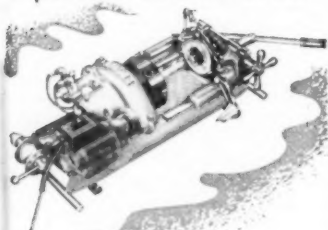
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WRITE FOR BULLETIN E

# BEAVER

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they enter the building. If the building is constructed of steel, the ground wire should be connected to the iron work about every 20 ft. if possible. Mechanical grounds can be bare copper wire, but must be placed so as to be free from mechanical injury and heavy enough to carry the current of the largest motor connected to the ground. All machines, guards and motors should be connected to this ground.

If there is still any static current at any of the belts in the plant, he should install static collectors and connect to same ground as motors and machines are grounded.

Static collectors can be made out of copper or steel, shaped as a fork or a few teeth like a comb and placed within a quarter of an inch of the belt.—R.J.B.

ANSWER to L-16—The trouble experienced in this case is static discharge to ground. Belted equipment always builds up static charges and the path necessary for discharge is usually taken care of during the original installation. Equipment supplied with ball bearings discharges the static from the belt and pulley through the bearing to the equipment frame and then through the equipment ground to earth. With sleeve bearings the film of oil separating the rotating shaft from the bearing is an insulator, thus preventing the normal discharge from taking place and allowing a static charge to be built up. When the charge is high enough to puncture the oil film it does, thus pitting the bearings.

The simplest means of eliminating this trouble, where the change to ball bearings is impractical, is to have fine copper wires, permanently grounded, trailing on the traveling belt surface. For appearance's sake, however, I prefer another method of eliminating the trouble. This is accomplished by mounting a copper contact or copper brush so that it bears on the rotating shaft and grounding this brush, or contact, to the equipment frame, which in turn is grounded. This furnishes a positive path for static discharge to earth and presents a very neat appearance.

If any of these methods is followed, the trouble of pitted bearings will disappear.—L.R.D.

## Test Rectifier Stacks

QUESTION K-16—Can someone suggest a way to test selenium rectifier stacks? I've tried measuring the resistance of the rectifier stack with an ohmmeter, which gives me no satisfactory results.—G. K.

ANSWER to K-16—I would suggest if you have difficulty in measuring the resistance of the stacks by use of an ohmmeter or any ordinary means, that you measure the equivalent resistance by means of wattmeters and an ammeter. That is, connect the stack up in the same way it would be used when placed in service. Connect a wattmeter in the input side of the stack and a wattmeter in the output side of the stack, and also an ammeter in the output side. Use the rectifier as ordinarily used (or place a load on it about the same as ordinarily used when it is placed in service). Then the difference between the two wattmeter readings will be the loss due to the effective resistance of the stack. Dividing the loss (watts) by the square of the current (amperes) will give the effective or equivalent resistance of the stack.

The efficiency of the rectifier equals the output divided by input. To make your readings of greater value, you should measure the resistance and efficiency of a same type of rectifier stack which has been very successfully used in actual service and then use it as a standard of comparison in judging other rectifier stacks.—E. B.

ANSWER to K-16—A simple way to test a stack in a selenium rectifier is to apply direct current first in one direction and then in the other, each time taking the reading of a dc ammeter.

If the rectifier is in good condition, it will show large current flowing in one direction and very small current in the other direction. The ratio of the two readings will be interpreted as the ratio of rectification to losses.

The amount of voltage applied will be determined by the number of cells in the stack. Use one volt per cell in the flow of direction and 15 volts in the other direction, that is, the blocking direction.

Full wave rectifiers can be tested the same way by testing one stack at a time; however input-output tests will be found more accurate.

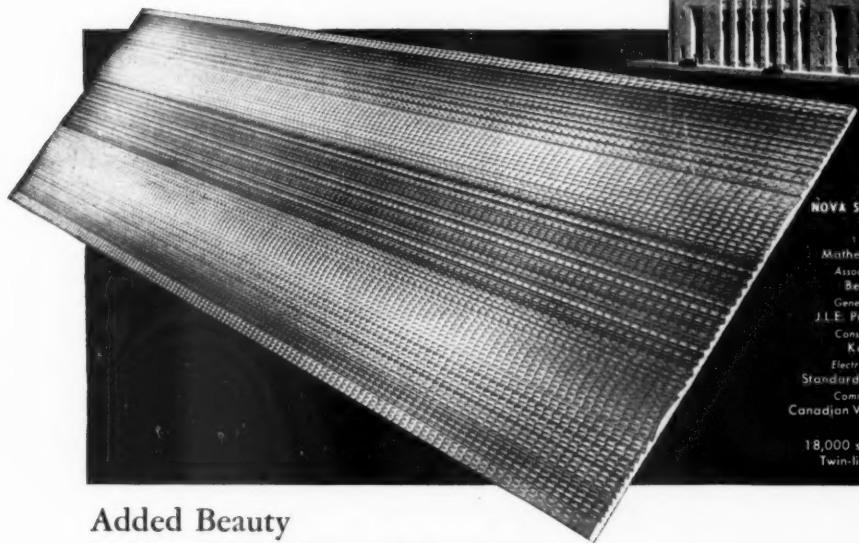
Connect a low drop ammeter across the dc terminals and apply ac voltage to the input terminals, raising the voltage gradually until the ammeter shows the rated current of the rectifier. The voltmeter reading is the voltage drop in the rectifier and the lower it is, the better the condition of the rectifier.

In both methods, a comparative test of a known good and a questionable rectifier should be made.

Since the resistance of a selenium rectifier changes with voltage and current, Ohm's Law cannot be used. Resistance test will not indicate the condition of the rectifier.—M.J.H.

# New CORNING Twin-lite Lens Panels

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## DC Motor Speed

**QUESTION J-16**—What determines speed of a dc motor? We have both 2 and 4 pole machines running 1800 and similarly 3500 rpm. Will some reader please explain how this is determined?—L. G. D.

**ANSWER to J-16**—The speed of a direct current motor is governed by the strength of the field and the number of armature conductors that are connected in series with each other. For example, in a given motor, the speed may be cut approximately in half either by making the field twice as strong or by using twice as many turns of wire in the armature. Within certain limitations, any number of poles may be used in the field as long as the number of armature conductors and the field strength are correct for a given speed.—L. B.

**ANSWER to J-16**—To answer this question adequately would involve studying the basic equations relative to the operation of dc motors. Briefly, whereas the speed of ac motors is a function of the source frequently, the speed (no load) of dc motors, being anticipated in the design, is a function of the amount of back or counter voltage generated by the motor while running. Remember the generated voltage of dc generators is a factor of the field strength and the speed of the armature.

These very same facts pertain to the back voltage of a motor generated while running. The motor speed itself varies with the effective voltage, this being the difference between the source and back voltage. One can readily see the connection between the fact that when the speed is reduced the counter will go down and the effective will increase. With this increase of effective voltage, the motor will tend to increase its speed and within its design limitations will again find its balance where the motor operates at the speed at which it is rated.

The above I believe answers your question in general. Though you do not mention what type dc motor you have reference to I presume its a shunt type. A series type has no definite no load speed and will go so fast it will break up—always keep such a motor connected to a load. This peculiarity does not happen with a shunt motor as its field is fixed. With a series motor the field varies. At no load its speed increases until the back voltage equals the impressed but it also decreases the field strength. The armature still has to go faster in its effort to generate sufficient back voltage—until the speed is ruinous.—E. A. M.

## What Causes Hunting

**QUESTION G-16**—I have a 1/6 hp., 110 volt, single phase, motor (split phase starting). This motor runs very quietly without load. When a load is applied, the motor seems to hunt. The sound is an intermittent hum which appears to be regular and seems to be at about one-half second intervals. New bearings have been applied. But the hunting persists. What is the cause of this hunting?—W. B. M.

**ANSWER to G-16**—Most single phase motors (split phase starting) or any induction type motor will usually hunt when running without a load, due to the rotor speed exceeding the cycle change, making the magnetic pull of the poles. In the question regarding the 1/6 hp. 110 volt motor, W.B.M. does not state that load is applied. The full load amperage of the 1/6 hp. motor is 3.2 amperes. Now, if a lighter load is applied, this load can act as a fly-wheel and tend to drive the motor and act as any unloaded motor. The quietness of the motor without a load may be due to the size of the rotor, also it can be due to the friction of the new bearings. The best way to check is to use a clamp-on meter, and find out what the motor draws under the different conditions.—E.S.H.

### Can you ANSWER these QUESTIONS

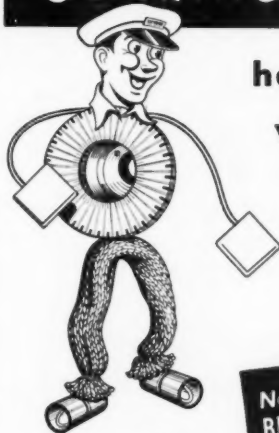
**QUESTION R17**—Is it possible to convert a D-valve steam engine into a reasonably efficient air compressor? If so, how can this be done?—E.A.H.

**QUESTION S17**—I have seen some people dynamically balance armatures with the ball bearings in place and then later remove these bearings before putting them on again when the complete motor is assembled. If they are taken off, they are almost sure to be put on the second time in a different position. I do not believe then that there is any advantage gained in balancing the rotor on ball bearings if these are not left on. Am I right?—P.S.

**QUESTION T17**—Can your readers tell us of an effective device to retain protective valve caps for compressed gas cylinders? It should probably be along the lines of the chain and sliding ring used for fire hydrant plug caps. Our annual loss of caps is serious.—P.C.Z.

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|          | SA-860   | .751"          | 2.60     | ADDRESS |
|          | SA-847   | .812"          | 3.00     | CITY    |
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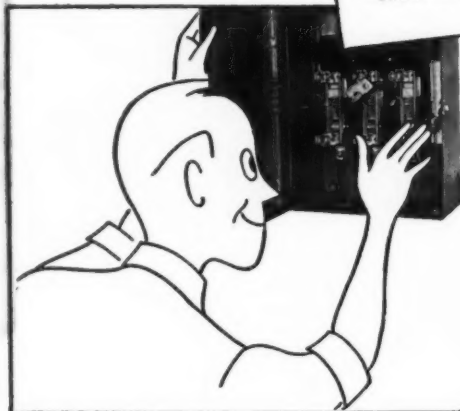
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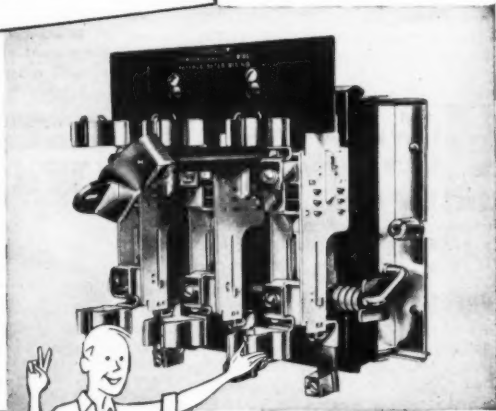
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and

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Electrical Engineer  
Fire Underwriters Inspection Bureau  
Minneapolis, Minn.

and

B. A. McDONALD  
Chief Inspector  
New York Board of Fire Underwriters  
Rochester, N. Y.

# Questions on the Code

## Plug Fuses On 250 Volts

**Q.** Recently I installed a two-pole 30 ampere 250 volt disconnect switch for an electric hot water heater. The water tank contained two immersion type heating units rated at 2500 watts each, one unit operating at a time.

Our inspector rejected the job because the switch contained plug fuses and not cartridge fuses. His reason for rejecting the job was that the heater was connected to an off-peak meter.

I fail to see where the Code has been violated and what effect the meter has on the type of fuses used. I would appreciate your view on the subject.—C.S.M.

**A.** Plug fuses are rated at 125 volts and were designed to operate on this voltage.

The code, however, in the second sentence of Section 2403a permits the use of plug fuses on circuits of over 125 volts on a system having a grounded neutral, but with no conductor at more than 150 volts to ground. As most utilities now use grounded neutral distribution systems, the use of plug fuses on 250 volt circuits connected to such systems, is permissible on the theory that with a short circuit from one wire to ground, the fuse opens at 125 volts, while with a short circuit across both wires, two fuses in series, open at 250 volts, which, theoretically, means that each fuse opens at 125 volts.

The matter of the type of metering has no effect on the ruling.—F.N.M.S.

## Emergency Lighting

**Q.** A new school house is being erected in our city and it is noted the plans show the emergency lighting circuit be supplied after the main fuses but ahead of the main disconnect. As I believe this is improper and wish to require that the circuits be supplied from the street side of the service coming to this building, I would like to know what section in the Code backs me up on my desire.—J.S.

**A.** Section 7011 of the National Electrical Code provides for the current source for emergency lighting circuits and you will note that under paragraph 7011 d the connection on supply side of the main service should be widely separated from the main service to prevent simultaneous interruption of supply through an occurrence within the building or group of buildings served. Now while this does not say that it shall be ahead of the main line fuses, in so many words, it infers it because any occurrence in the building which might cause an electrical fault would naturally open the overcurrent protective devices and if the emergency circuit was tapped between the main line disconnect and the overcurrent protective devices the installation would be in violation of this paragraph. Therefore, your contention that this connection should be on the street or line side of all overcurrent devices is in full accordance with this paragraph.—G.R.

## Armored Cable And Masonry Construction

**Q.** I would like to know which is the best method of wiring with armored cable in plastered cinder block or tile.—J.J.F.

**A.** Installation rules for armored cable are covered by Article 334 of the N.E. Code. According to Section 3342 of this Article note, however, that this wiring method is limited to dry locations except for lead covered armored cable. It is recognized for use embedded in plaster finish on brick or other masonry, except in damp or wet locations. Many Inspectors interpret this provision as applying to interior walls of a building but not the outside walls. Armored cable may be run or fished in the air voids of concrete masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness. Note the use of the word concrete which tends to eliminate the cinder block wall. In view of the above rule which recognizes armored cable em-

bedded in any form of masonry many Inspectors accept armored cable when run in the voids of cinder block walls when such walls are dry walls. On outside walls or in damp or wet locations armored cable lead or other wiring methods must be used to satisfy the Code. Under plaster extensions may also be used with armored cable as provided in Article 344. It might be well to consult your local Inspector concerning this question since the rules in question have been the source of different opinions and interpretations.—B.A.McD.

## Location of Emergency Switch

**Q.** The standards of the National Board of Fire Underwriters for the installation of Air Conditioning, Warm Air Heating, Air Cooling and Ventilating Systems, Pamphlet No. 90, Part 1, 170 Controls, reads as follows: "Each installation shall be equipped with a manual emergency stop located at a conveniently accessible point for quick shutting down of the fan in case of fire. This location should be submitted to the inspection department having jurisdiction for approval."

On a large number of installations, the air conditioning unit is located in the basement or in some other remote location.

The question is, would a standard single pole switch located in the occupancy served and connected in the holding coil circuit of the magnetic switch meet N.E.C. requirements, or would the switch installed in a break glass enclosure, be more satisfactory?—L.J.W.

**A.** The best location for the emergency stop switch would depend largely upon the occupancy.

The idea of having a stop switch on systems as mentioned above, is to prevent blowing smoke to all parts of the occupancy through the heating or ventilating ducts. In some instances, it would be best to have it near the fresh air intake, but this might be at a remote or rather inaccessible place.

In other instances, it might be handy to have the switch in the Chief Engi-

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neer's or the Store Manager's Office, especially where fire alarms are turned in or reported to these individuals.

In some installations, a number of single pole switches located at various strategic points, all connected in series, in the holding coil circuit of the magnetic switch, would best serve the purpose.

Probably because of these varied conditions, is why Pamphlet No. 90 left it to the jurisdiction of the inspection department.—F.N.M.S.

## Service Drop Conductors

**Q.** Does the Code permit the use of Type T (Thermoplastic) insulated conductors to be used as a service drop?—M.H.

**A.** Section 2303 C of the Code only recognizes Types R or W.P. conductors for service drop use. Official Interpretation No. 282, however, advises that the Electrical Committee intended to include Type T insulation for such use. This question will be clarified if the 1951 proposed supplemental revision of the N.E. Code is accepted.—B.A.McD.

## Ground Connections

**Q.** I recently opened a contracting shop in this city and one of my first jobs consisted of a 400 ampere service installation which I grounded by means of a No. 4 wire running through a 1/2-inch conduit as I have always done in the past and much to my surprise the local inspector tagged the ground connections stating that I would have to use a 1/2-inch conduit for the No. 4 conductor. When I showed him that under Table No. 4 one is allowed to place a No. 4 conductor in a 1/2-inch conduit, he immediately referred me to Section 2594 of the National Electrical Code and pointed out that a No. 4 conductor should be in a 1/2-inch conduit. Can you straighten out this apparent discrepancy in the Code?—E. R.

**A.** If you will reread Section 2594 of the National Electrical Code, you will note that in the heading for the table under this section the first column which is for copper wire has a heading which reads: "For Wiring System and/or Service Equipment". The second column has a heading which reads "For Service Equipment Only". Furthermore in the fine print



**REINSPECTION NEED** of rural wiring installations brings into a huddle Thomas P. Branch (left) REA Power Utilization Specialist, Washington, D. C.; and Wm. Boon, chief electrical inspector of Topeka, Kansas.

note you will see the following wording: "Conduit, pipe or electrical metallic tubing cannot be used alone as the grounding conductor for a wiring system." In other words, this table covers not only the grounding conductor for the wiring system, but also the grounding conductor for the service equipment and therefore if several pieces of equipment are located adjacent to each other, constituting a group of service equipment, it would be possible to ground the neutral of the wiring system with a No. 4 conductor in a 1/2-inch pipe but the other component parts of the service would have to be grounded to the first cabinet by means of a 1/2-inch or larger conduit or a 1 1/2-inch or larger electrical metallic tubing bushing or a conductor of proper size. Therefore your installation consisting of a 4-inch grounding conductor contained within a 1/2-inch conduit is perfectly proper and does comply with the National Electrical Code.—G.R.

## Fluorescent Fixtures As Raceways

**Q.** I would like to have explained wiring procedure on continuous rows of fluorescent fixtures, single and double bulbs, because the Code says that a fixture shall not be used as a wiring trough, Surface and Recessed Types.—P.La.S.

**A.** Section 4150 of the Code definitely recognizes the use of fixtures as raceways under the conditions covered by this rule. Any fixture which is approved as

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a raceway for circuit conductors may be so used. The Underwriters Laboratories list several fixtures for such use.

If the fixture is not approved as a raceway but is approved for end to end assembly to form a continuous raceway the conductors of a single branch circuit may be brought through such a fixture assembly. This branch circuit may be a multi-wire circuit.

In line with the foregoing Code provisions you may install continuous rows of fluorescent fixtures and use the fixture as a raceway. If the fixtures you are using are not approved as a raceway or for end to end assembly it will be necessary to bring the branch circuit conductors direct to each fixture.—B.A.McD.

## Range Demand

**Q.** In the wiring of a 12 kw electric range, Table No. 29 of Chapter 10, Note 4, permits the demand factor to be applied to the branch circuit wiring. Our city code, which is similar to the above table, permits us to wire this range with No. 8 wire, having a capacity of 35 amps.

Article 422, Section 4242 permits, as I understand it, over current protection of 50 amps. when wired as specified in Article 210, Section 2123c. Our local inspector requires that we fuse this circuit with 35 amps. capacity which naturally gives some trouble when the range is using full load.

Is 50 amp. over current protection a violation of the National Code when the range is wired with No. 8 wire?—F.O.D.

**A.** Yes, it would be a violation of the National Electrical Code to provide 50 amp. protection to an individual branch circuit of No. 8 wire supplying an electric range.

According to Table No. 29 of Chapter 10, a demand of 8 kw may be used in computing the conductor size necessary to supply a single 12 kw range.

8 kw at voltages between 208 and 230 would mean amperages between 30.7 and 38.4. For this amount of current No. 8 wire, which, according to Table 1 of Chapter 10, has a carrying capacity of 40 amps. would be needed and of course, it should not be fused at more than 40 amps. on a range circuit.

Neither Section 4242 nor 2123c permits protecting No. 8 wire on a range circuit at 50 amps.

Note that the first sentence of Section 2126 permits an individual branch circuit to supply any specific load.—F.N.M.S.



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tortion of back plate or clamp will not affect alignment of cover. The cable clamp closes the opening completely regardless of size of wire used, as now required by the Underwriters' Laboratories. Mounting screw is retained in the cover, starts readily and easily. And heavy phosphor bronze contacts with large radius on ends permits easy insertion of range receptacle cap. The new P&S Range Receptacle meets or exceeds all REA and Federal specifications and carries Underwriters' approval. See it, try it, buy it today from your P & S Wiring Device distributor!

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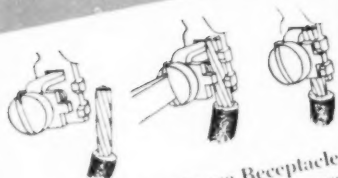
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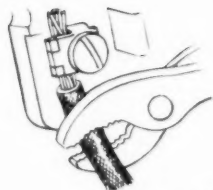
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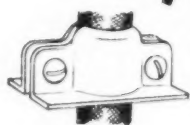
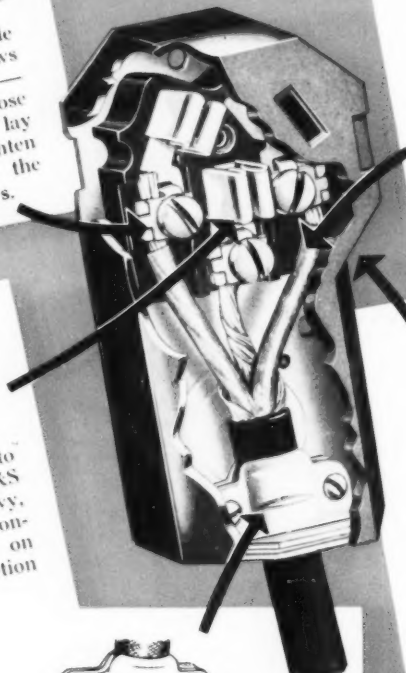
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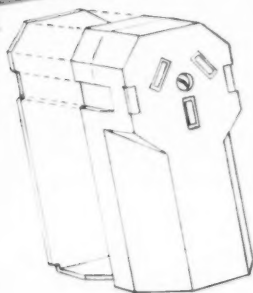
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## Standby Generator

**Q.** Several farms in this area are desirous of purchasing and installing standby electric generating plants and the local R.E.A. office is very much opposed to such installations due to the possibility of current being generated by such a standby plant being imposed upon their high line. In fact, they have now refused to serve any farm which has installed a private generating plant until some method can be worked out whereby it will be impossible for such a private plant to place any current on their lines. We therefore will appreciate your suggestions as to the method of interconnecting the electrical system on a farm with both the Utility and the private generating plant.—T.H.

**A.** On a farm served with a single phase three wire service, a double throw three pole switch should be used with the farm load being tapped to the center terminals of the switch. In one position the Utility could then supply the farm and with the switch in the other position the farm might be supplied by its own plant without their being any possibility of current privately generated being imposed on the distribution network. Inasmuch as the R.E.A. or Utility grounds are always interconnected and therefore offer a lower resistance than the driven grounds on the farm, it is most essential that the three pole switch be utilized on a three wire service in order that the neutral as well as the ungrounded conductors are opened, otherwise any unbalance of current resulting from the use of a standby generator will flow back on the company neutral to ground. These double throw three pole switches may be of the manual or automatic type, and in no case will their use in any way jeopardize workmen working on a distribution line of the Utility.—G.R.

## U.S.E. Cable Installations

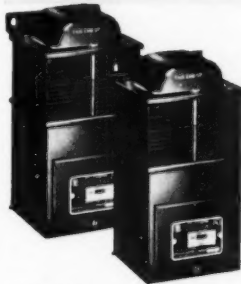
**Q.** What type fasteners is recommended on U.S.E. or trench wire when used inside buildings?

Are entrance caps necessary when coming out of top of conduit on side of building with U.S.E. wire or trench wire?—E.W.B.

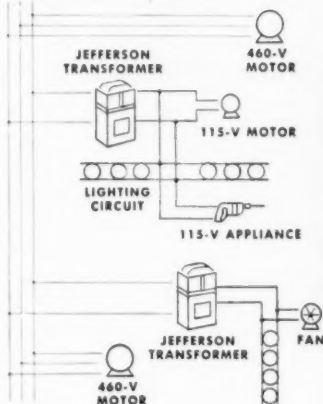
**A.** Since the installation of Service Cable inside a building is subject to the provisions of Article 336, we find that Section 336.3 covers your question which concerns the supports for the cable. This Code provision calls for



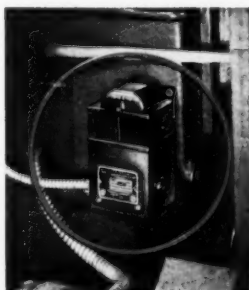
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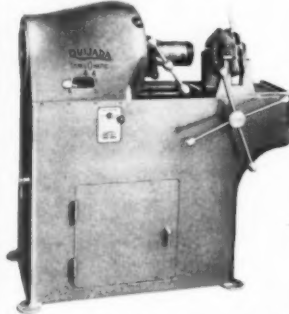
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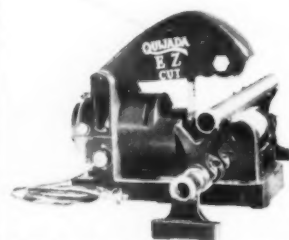
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approved staples, straps or similar fittings so designed and installed as not to injure the cable. In so far as the Code is concerned either the strap or the staple is acceptable as fasteners. Personally I prefer the strap since it results in a more workmanlike appearance and there is less chance of injuring the cable when installed.

Section 2337 requires service raceways to be equipped with a rain tight service head. I believe, however, that Section 2312 and 2313 covers your question. These Sections require that underground Service conductors be protected from mechanical injury when brought up the side of a pole or where they enter buildings. If this protection is in the form of rigid conduit a standard service head or pothead is preferable at the end of the conduit. Since the conduit is not part of a complete conduit installation and is used to afford mechanical protection for a small part of the service run many Code authorities do accept a conduit lushing at the end of the conduit which is suitably sealed with pothead compound to keep the water out.—B.A.McD.

## Underground Cable

**Q.** I have a question on the Code. I am using three insulated No. 6 wires as feeders to a group of tourist cabins. The inspector says that this underground cable, Type RR, cannot be brought up inside of sealed stud-dings. This is not the main service entrance but only feeders. I will also use two No. 10 wires as sub-feeders to cabins which do not have water heaters.

I would think that this type of wire which will withstand underground conditions, would surely stand up in a guarded location in almost any installation. Why not?—D.J.S.

**A.** There are several points to be covered in the above question. First, Type RR cable or wire, is not recognized in the National Electrical Code and therefore will not be given consideration in this column, at least by this writer.

If service cables are to be run underground, they must be of Type USE or Type ASE for use underground and so marked.

Next, service conductors must not be run "up inside of sealed stud-dings". They may be run directly through a wall from the outside to service equipment located on the inside of the wall.

Of course Types USE and ASE service entrance cables, may be used for interior wiring such as for a feeder from service equipment to a distribu-

tion panel if all of the wires are fully insulated and this of course, includes the neutral. In this case, they may be run "Up inside the sealed stud-dings".

The intent with this latter use of service entrance cable, was undoubtedly not to apply to single conductor service cables, but only to multiple conductor cables assemblies.—F.N.M.S.

## Overcurrent Protection

**Q.** Under Section 2351 of the Code, permission is granted to have not more than six switches or six circuit breakers in a common enclosure or in a group of separate enclosures located at a readily accessible point nearest the entrance of the conductors either inside or outside of the building wall as the sole means of disconnecting the service from the building. Recently my attention has been called to installations in which more than six circuit breakers have been installed without a main line switch or breaker ahead and I have been told that inasmuch as the handles on several of the single pole breakers are tied together, the installation should be considered acceptable. Can you verify this rumor?—M.J.J.

**A.** When the ruling contained in Section 2351 was originally inserted in the National Electrical Code, it was the intent of the Electrical Committee to limit the number of manual operations necessary to six in disconnecting the electrical system in any building. As this section does not differentiate between a single pole and a double pole switch or breaker, it would, of course, be perfectly permissible to use six two pole breakers protecting six 230 volt circuits. Therefore, if only single pole breakers or switches were used, it was felt by some that the rule was actually unfair unless it was changed to provide for the same amount of use of each ungrounded conductor. Therefore this has now been changed to permit the use of up to six overcurrent protective devices on each of the two ungrounded conductors on a three wire service provided the number of operating handles necessary for the control of the circuit does not exceed six. Therefore on a circuit breaker installation it would actually be possible to have twelve single pole breakers, six being supplied from each ungrounded conductor with the operating handles of two of these breakers, one from each ungrounded conductor, interconnected in an approved manner so a single manual operation would open both breakers.—G.R.

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# \$12,500



The shop that can do a 3-hour job in 1 hour and 5 minutes, is bound to make money, for that 64% saving in labor time is pure profit. This is the accomplishment of a well-known motor rebuilding company located in the Southwest, which uses four Ingersoll-Rand electric Impacttools in tearing down and assembling automobile engines.

The switch to electric Impacttools saved 115 minutes per engine, which enabled them to increase their production by 3 completed engines per day. This meant an additional clear net profit of \$231 per day, figured conservatively, or \$50,000 a year... \$12,500 for each Impacttool. Needless to say, the cost of the tools was amortized in just a few days.

Send for your copy of Report 5082-6 which gives all the names, facts and figures on this outstanding extra-profit story.

Ask your Jobber for an Impacttool demonstration

No Motor Burn-Outs,  
can't stall motor

No-Kick, No-Twist  
to operator

## Ingersoll-Rand

11 Broadway, New York 4, N. Y.

Originator of Impacttools—Air and Electric

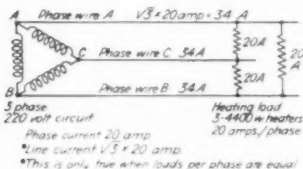
558-18

|           |                |              |                 |
|-----------|----------------|--------------|-----------------|
| Runs Nuts | Drills Masonry | Drives Studs | Bores Wood      |
| Taps      | Wire Brushes   | Saws Holes   | Extracts Broken |
| Reams     | Drives Screws  | Drills       | Studs           |

## Heating Load

**Q.** I recently installed several electrical heating units on a 220 volt, three phase circuit. In figuring the load in amperes I divided the watts per device by 220 volts and installed the size conductor accordingly. Now I am advised that the conductors are too small and that I did not figure the load properly. Can you advise what may be wrong?—A.B.

**A.** From the above information it appears that you figured the current per phase which on a 3 phase system is considerably less than the line current per phase. In order to clarify this statement let's assume that you connected 3-4400 watt heaters on a 220 volt 3 phase circuit, one heater per phase. Dividing 4400 watts by 220 volt would give 20 amperes per phase. The current in the line wires, however, would be equal to  $\sqrt{3} \times 20$  amps, which is about 34 amps. It would therefore be necessary to use a No. 8 Type R conductor instead of a No. 12 Type R conductor. The sketch should clarify this question. The



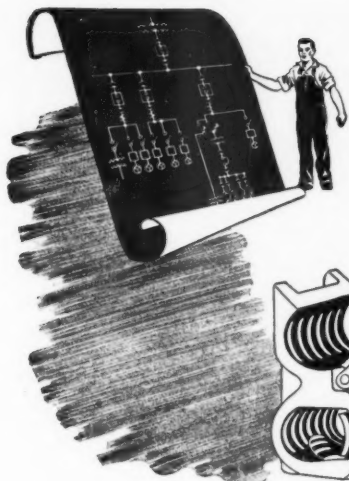
same question concerns the installation of some 3 phase motors. As a result the full load current rating of a motor is always given as the line current and not the phase current.—B.A.McD.

## Underground Wires

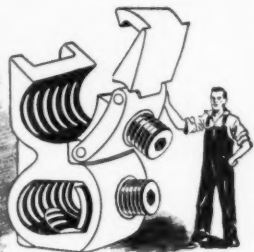
**Q.** Kindly let us know if Type RH wire is approved for underground use—B.J.C.

**A.** Wires for use in conduit or other raceways, which are buried underground or in concrete which is in direct contact with moist earth, are to be of Types RW, TW or lead covered. Such wires are not approved for direct burial in the ground without being encased in conduit or other raceways.

For wires which are to be buried directly in the ground, they should be approved as Type USE (for use underground), or Type ASE (for use underground or above ground). Such wires are now available in single conductor or multi-conductor cables.—F.N.M.S.



**32** connector sizes  
needed on this job!



**One** connector size is  
plenty with this  
new XTP!

## For Tee or Parallel Taps!

**ONE 0.2. FITTING DOES THE WORK OF 32**

One typical XTP connector replaces up to 32 different parallel or tee connectors because each XTP accommodates a wide range of wire sizes. All told, the XTP line of but 25 connectors will receive over 400 wire-size combinations!

For either tee or parallel taps, just snap special hinged clamp over main and tighten—the connector is permanently in place, positive contact assured. When you're ready to connect the tap, simply insert wire in tap end of connector. A wrench-turn or two and the job's done!

### 25 CONNECTOR SIZES do practically all tap jobs.

- Accommodate over 400 combinations of wire sizes
- Fit wire from #8 to 1,000,000 CM

### HINGED CONSTRUCTION for quick installation.

### SPRING STEEL LOCKWASHERS (tin plated) maintain pressure;

- Hold resiliency—assure permanent connection

### PRESSURE PLATES designed for maximum contact and grip.

- Serrated for firm grip
- Can not rotate during installation

### HIGH STRENGTH, HIGH CONDUCTIVITY.

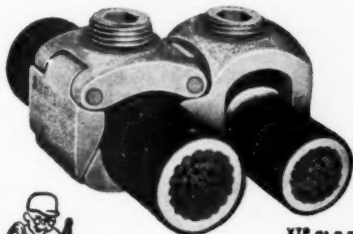
- High conductivity copper alloy for body
- Extra strength copper alloy for pressure plates and hinged parts

Get these new combination fittings from your wholesaler now . . . and put an end to bulky assortments of tap connectors.

**CONDUIT FITTINGS • CABLE TERMINATORS  
CAST IRON BOXES • SOLDERLESS CONNECTORS  
GROUNDING DEVICES • POWER CONNECTORS**



XTP as a "T" tap



XTP as a parallel tap



*They're O.K. if They're O.Z.*

Ⓜ 641

**O.Z. ELECTRICAL  
MANUFACTURING  
COMPANY**  
262 BOND STREET • BROOKLYN 2, N. Y.

# 50 YEAR

## report to our customers~

YOU HAVE PAID US  
OVER \$5 BILLION



FROM DATE OF INCORPORATION ON NOVEMBER 23, 1900 TO DECEMBER 31, 1949

### THE COMPANY RECEIVED:

|   |                        |
|---|------------------------|
| From customers for products purchased by them         | \$5,122,702,261        |
| Dividends received, interest earned, and other income | 76,068,236             |
| Total revenues  | <u>\$5,198,770,497</u> |

### THE COMPANY PAID OUT OR PROVIDED:

|  |                        |                      |
|--|------------------------|----------------------|
| For raw materials, supplies, and services bought   | \$2,766,354,971        |                      |
| Provision for depreciation (wear and tear or obsolescence) of plants, buildings, machinery and equipment and for depletion of coal, iron ore and limestone, etc., by mining operations | 270,852,769            |                      |
| Federal, State, local and miscellaneous taxes  | 267,462,953            |                      |
| Interest and other costs on long-term debt (including dividends of \$27,263,803 paid to preferred shareholders)  | <u>117,724,128</u>     |                      |
| Total costs  |                        | <u>3,422,394,821</u> |
| Leaving for wages and salaries of employees, dividends to shareholders, and amount required to be retained by company for needs of the business  | <u>\$1,776,375,676</u> | <u>100.00%</u>       |

### \*OUT OF WHICH THERE WAS PAID:

|  |                        |                |
|--|------------------------|----------------|
| Employment costs (pay rolls, vacations, social security taxes, insurance and pensions paid to or for account of employees) | \$1,474,693,687        | 83.02%         |
| To common shareholders as dividends  | 125,126,950            | 7.04           |
| Amount retained in the business for present and future needs and to assure steady work for employees                       | <u>176,555,039</u>     | <u>9.94</u>    |
| Total  | <u>\$1,776,375,676</u> | <u>100.00%</u> |

Your patronage and the American system of free enterprise have helped make this company an important factor in the steel industry. Our future depends on keeping America free, so that any group of citizens may organize

a business, at any time—with the expectation that it, too, may grow strong—provide jobs, supply needed products and achieve success in the next 50 years. In the preservation of the American way of life lies our future hope.



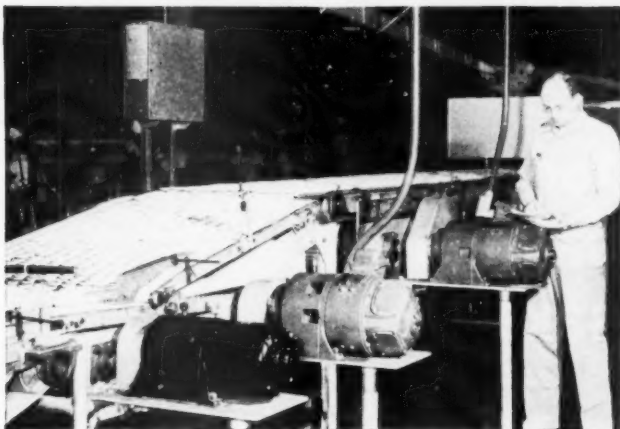
## The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio  
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON, ALLOY AND VOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

# Practical Methods



**COORDINATED DRIVE** is provided on this 600-ft. long baked goods production line in Keebler Weyl Baking Company's plant at Philadelphia, Pa. by 26 General Electric Thy-mo-trol electronic control units. Charles L. Taylor, plant electrical engineer, inspects the electronic controlled drive motors.

## Bakery Uses Electronic Controls

INDUSTRIAL

The Keebler Weyl Baking Company, Philadelphia, uses 26 General Electric Thy-mo-trol units to provide a co-ordinated drive on its 600-foot long baked goods production line. This line makes a number of biscuit-type baked products, which are formed with a cutting machine at the production line entrance, baked in a continuous oven, stacked on cooling conveyors and packaged at the delivery end.

These flexible electronic motor controls with gear motors enable the company to maintain coordination and make adjustments easily and efficiently on the production line. They also provide a sanitary installation and require a minimum of space, which facilitates maintenance work.

Four  $\frac{1}{2}$ -hp. Thy-mo-trol units were originally purchased in 1945 to replace two English adjustable-ratio pulleys and gear boxes. This original installation demonstrated the many advantages inherent in electronic controls, leading to their eventual adoption on the long production line, and the installation of five additional units on other lines. There are now 35 units installed throughout the plant.

On the long production line all the 30 units are standard and controlled individually, or in groups of 18, 13 or 8 by pushbutton stations through a co-

ordinated system. Vernier controls on each drive provide infinite individual speed adjustment.

On the original four Thy-mo-trol units maintenance costs were approximately \$9 a year for the first two years. Electrical engineer C. L. Taylor now expects maintenance costs to be negligible.

## Mounting Outlets on Concrete Core Slabs

WIRING

Ceiling construction of hollow-core, precast concrete slab is being used on many one-story structures—frequently on institutional buildings. Such a design presents installation problems to

the electrical contractor who must conceal lighting and power conduits.

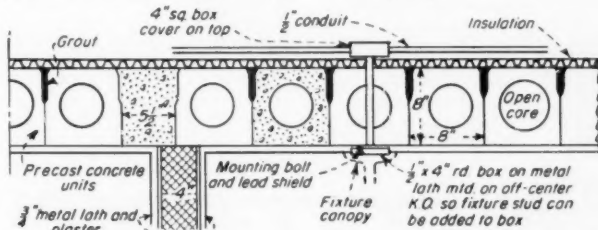
As indicated in the accompanying diagram, the precast slabs are of square cross-section (8" x 8") with a hollow core about 4 inches in diameter. In one children's home installation, these sections were bonded together with a grout and topped with a layer of insulation. A  $\frac{1}{2}$ -inch layer of metal lath and plaster were added to the underside to provide the finished ceiling surface. A conventional peaked roof structure above the slab completed the design.

The only practical way to conceal the conduits on this project was to install them immediately above the slab (over the insulation layer) and drop down to each fixture outlet. To accomplish this, engineers of the Westgate Electric Construction Company in Columbus, Ohio, made up box assemblies with long nipples to go through the slab and meet the metal lath level.

Each box assembly consisted of a 4-inch square outlet box and  $\frac{1}{2}$ -inch conduit nipple extending out of the back of the box. When installed, the box rested on the insulation (box cover on top) with  $\frac{1}{2}$ -inch conduit raceways connecting the outlets. The nipple protruded through a hole drilled through the precast slab.

A shallow 4-inch round ( $\frac{1}{2}$ -inch deep) outlet box was installed on the bottom of each nipple. To permit the addition of a fixture stud this pancake box was mounted on an off-center knockout and secured with a lead shield and bolt. Any extension of the fixture outlet beyond the finished plaster line was concealed by the fixture canopy.

The peaked-roof construction of the building was of economic assistance in routing circuits for branch runs could then take the shortest distance between points.



Section Through Ceiling One Story Structure

**ONE METHOD** of mounting outlets to a concealed conduit system when hollow-core, precast concrete slab construction is encountered.



If you've ever been up on a 50-foot stick when your life depends on the quality of the belt and safety strap you use, you will appreciate the high quality and care that is so much a part of all Klein equipment. When life's at stake, there can be no compromise with quality. Old timers know that Klein equipment has stood for quality in linemen's tools and equipment—"since 1857."

#### ASK YOUR SUPPLIER

Foreign Distributor:  
International Standard Electric Corp.  
New York



If you have not received a copy of the new Klein Pocket Tool Guide, write for one. It will be sent without obligation.



201-N. E. Plier



5233 Klein-Kord Safety Strap



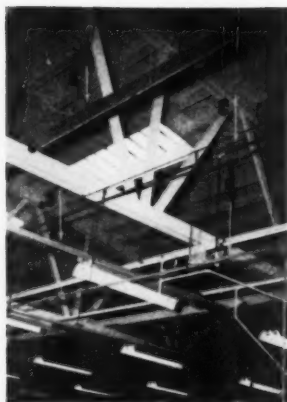
5249 Klein-Line Tool Belt



1901-M Climber



1628-38H Klein Chicago Grip



**PLUG-IN BUSDUCT** (A), trolley-duct (B), cable-conduit (C) and fixture-channel distribution systems (D) are combined in this well planned installation designed and erected by the California Electric Company.

## Flexible System Uses Product Variety

#### DISTRIBUTION

The variety of distribution means installed in Bendix-Westinghouse Automatic Air Brake Company's new Pacific Division plant in Oakland, California, reflects the facts that the electrical contracting company, California Electric, had a comprehensive knowledge of products on the market and their intended purposes. For example; primary power is distributed through plug-in bus-duct runs, suspended by hangers fastened to roof purlins. Current for portable tools is provided through trolley-duct, suspended by means of hangers and messenger cables strung between roof trusses. A cable-conduit system carries power from plug-in boxes to trolley-duct taps. Two-lamp industrial fluorescent lighting units are mounted to continuous fixture channels, with lighting units spaced at double the fixture length so that, if future lighting requirements demand, additional units can be installed along the same channels to double the illumination levels. The installation is relatively modest, yet judicious selection of distribution methods make this an example of planned wiring.

## Loading Platform Has Electric Elevator

#### TRANSPORTATION

Receiving material and shipping crated ranges is facilitated at the Perfection Stove Company's new Ivanhoe



**Mathias KLEIN & Sons**  
Established 1857 Chicago, Ill., U.S.A.  
1200 BELMONT AVENUE CHICAGO 18, ILLINOIS



# Cables run COOLER... in TRANSITE DUCTS



... reducing  
copper losses  
... increasing  
current capacity  
... prolonging  
insulation life



HERE'S HOW to reduce copper losses . . . increase current carrying capacity . . . and prolong insulation life—run your cables in Transite\* Ducts.

Current carrying capacities can be increased in a typical duct bank as much as 5%, or I<sup>2</sup>R losses can be reduced 11%, for cables located in Transite as compared with other ducts used for power circuits.

And, Transite Ducts assure permanent duct banks because Transite is incombustible; is immune to rust and rot; is unaffected by electrolysis; will not slag under action of an arc, and will retain its high original strength.

An unusually smooth bore assures no injury to cable sheath, either in natural movement under load, or when pulling-in cables. Long, lightweight lengths can be quickly and economically installed. In addition, a full line of fittings simplifies even the most complicated of installations.

For full information on Transite Ducts, write for Data Book DS-410. Johns-Manville, Box 290, New York 16, N. Y.



\*Reg. U. S. Pat. Off.

## How Transite Ducts increase current carrying capacities

Type cable 3 cdr. 500 MCM Compact Sector, 15 KV

(6th Edition AIEE Spec.)

No. of cables—3 (all loaded in one bank)

Daily Load Factor—75%

Earth Temp. ambient—20 C

|  | Transite | Other |
|--|----------|-------|
| Total Therm. Res. to Dielectric Loss (C watts/ft.) | 5.66     | 6.17  |
| Total Therm. Res. to Copper Loss (C watts/ft.)     | 4.44     | 4.95  |
| Temp. Rise from Dielectric Loss (C)                | 1.9      | 2.1   |
| Allowable Rise for Copper Loss (C)                 | 59.1     | 58.9  |
| Allowable Watts per ft. cable                      | 4.44     | 3.96  |
| Allowable Current—(Amps. per cdr.)                 | 386.     | 365.  |
| Allowable Current—(Relative %)                     | 105.6    | 100.  |

**Johns-Manville**

*Transite Ducts*

"KORDUCT"—for encasement in concrete

"CONDUIT"—for use exposed and underground without encasement

**"Who Says *REGULAR PHONES*  
can handle intercom needs?"**



**Sure she's mad!**

And you'd be too if you were trying to handle pesky (to her!) intercom messages in addition to important outside calls. Stop wasting her time and your money. Get real efficiency by installing a Couch Private Phone system . . . free outside lines . . . replace regular phones used only for intercom calls . . . reduce unnecessary calls. From 2 to 50 phones, Couch has the system right for your needs. Write for information today.



Type 52  
Four Button Model

#### COUCH AUTOPHONE SYSTEM



. . . with  
simplified  
dialing

30 or 50 line systems . . . "one shot" dialing saves time, eliminates manually operated switchboard . . . simple, rugged, inexpensive.

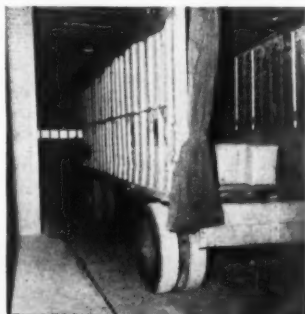


**S.H.COUCH** Co., Inc.  
DEPT. 801 NORTH QUINCY 71, MASS.

Private telephones for home and office . . . hospital signaling systems . . . apartment house telephones and mail boxes . . . fire alarm systems for industrial plants and public buildings.



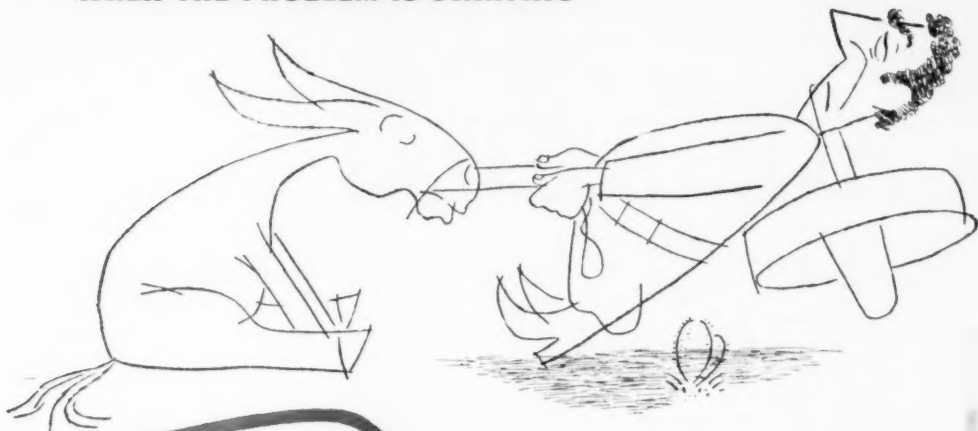
**TRUCK** backs through doors of shipping dock until rear nearly touches loading platform. Truck is raised or lowered until floor of truck body and shipping platform are level, with rear wheels resting on elevator platform. Pushbutton station on platform controls action of elevator and overhead interior doors.



**OVERHEAD** lighting provides illumination in shipping dock area. Roll-up exterior doors can be raised or lowered from same pushbutton station that controls elevator. Loading can be completed with truck entirely inside building, promoting comfort during cold weather. Unit heater is installed to maintain comfortable temperatures.

Road plant in Cleveland, Ohio, through the installation of a special elevator installation at the truck loading platform. This installation raises or lowers the rear wheels of the delivery trucks, making it possible for tail boards to have the exact elevation of the shipping dock. Dollies, industrial trucks and other wheeled carrying equipment can therefore enter or leave the trucks without jarring or bumping, and material need only be handled once in the loading or unloading process. Pushbutton control regulates the height of the raising and lowering platform, the buttons being pushed by an operator standing on the platform.

## WHEN THE PROBLEM IS STARTING



**THE ANSWER IS  
BRYANT**

Every Bryant Fluorescent Starter is manufactured under the strictest supervision to assure dependable performance and long life. Each starter is:

- Made from the highest quality materials
- Precision assembled to exact specifications
- Individually inspected and electrically tested on actual lamp load

### "NO-BLINK TYPES"

These starters eliminate blinking and flickering of lamps which have reached the end of their useful life, thereby protecting the ballast and prolonging the life of the starter.



#### AUTOMATIC RESET

(Restores the circuit as soon as new lamp is inserted.)

Two pin—for 40, 85, 90 and 100 watt lamps.

Four pin—for 85, 90 and 100 watt lamps.



#### MANUAL RESET

(Circuit restored by pushing small red button in top of starter, after new lamp has been installed.)

Two pin—for 15, 20, 30 and 40 watt lamps.

Four pin—for 85, 90 and 100 watt lamps.

### STANDARD TYPES



Two pin—for 4, 6, 8, 15, 20, 25, 30, 40, 85, 90 and 100 watt lamps,—18 watt "Circlarc" and 32 watt "Circline" lamps.

Four pin—for 85, 90 and 100 watt lamps.

Listed as Standard by Underwriters' Laboratories, Inc.



J-99852

**THE BRYANT  
ELECTRIC COMPANY**

Bridgeport 2, Connecticut

CHICAGO • LOS ANGELES

# SORGEL AIR-COOLED TRANSFORMERS

The **Best** *DryType* Transformers  
at any price

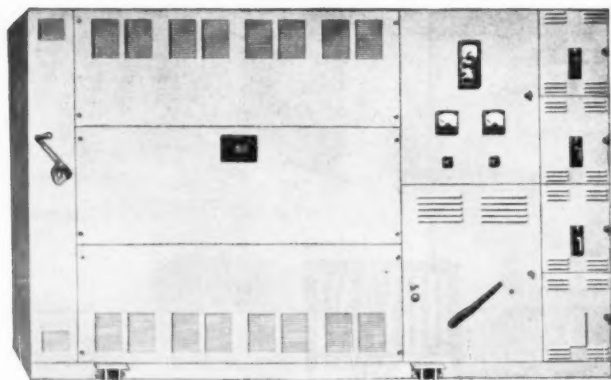
## Most Complete Line

1/4 to 2000 Kv-a. All voltages up to 15,000 volts.  
Single phase and poly-phase units.  
Insulating types and auto transformers.

In addition to our large variety of  
standard types, we build

**Special Transformers**  
to meet any special requirement.

**Unit Sub-Stations** Complete with primary  
and secondary switch gear, metering and other accessories.



1300 Kv-a. 13,200 volt unit, with primary disconnect, secondary metering, and circuit breakers.

*Sales Engineers in Principal Cities*

**SORGEL ELECTRIC CO., 836 W. National Ave., Milwaukee 4, Wis.**

*Pioneers in the development and manufacturing of Air-Cooled transformers*



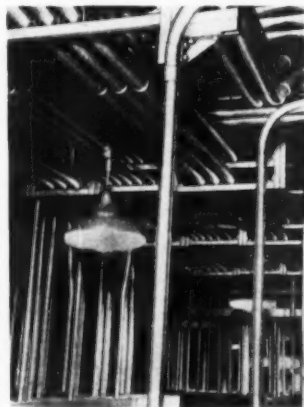
1 1/2 Kv-a.  
Single Phase  
460/230 to  
115 volt

From the same position the operator can raise and lower the roll-up exterior doors, making it possible for trucks to be unloaded inside the plant during winter months. A thermostatic control on the wall automatically activates an overhead unit heater when doors are opened and temperatures drop. Roll-up doors and automatic temperature regulators are also installed at the railroad siding entrance that permits freight cars, like trucks, to enter the building proper and be loaded or unloaded in the warmth of the plant interior.

### On-the-Job Framing For Conduit Racks

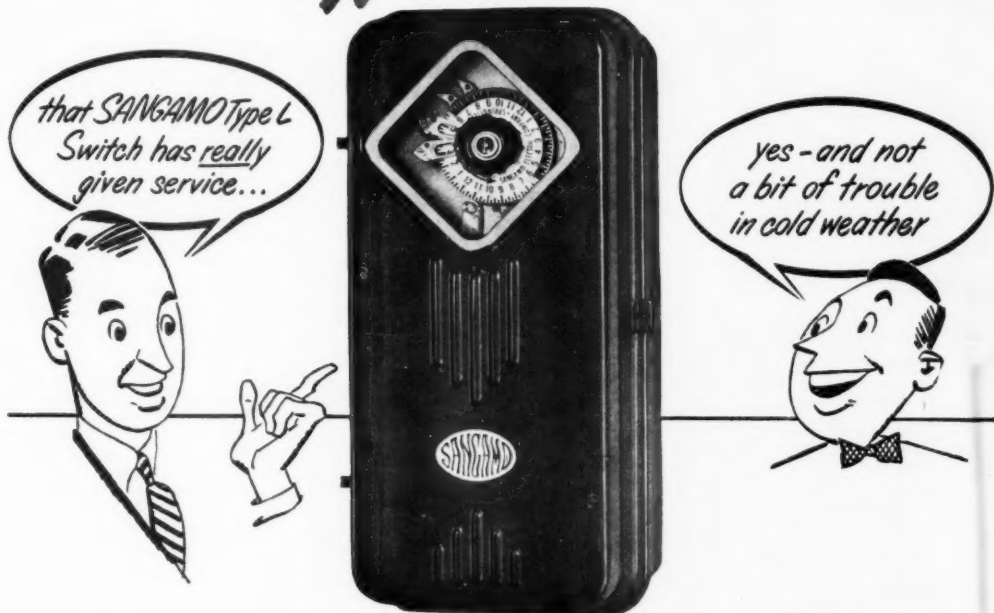
CONSTRUCTION

Eliminating the necessity for special construction tools, installing conduits close together to conserve space, making it possible for crews to erect on-the-job framing and making it possible to install conduit hangers without welding or drilling are some of the advantages achieved through the use of Unistrut sections in the Dan River Steam Plant of the Duke Power Company. This all-purpose metal framing supports heavy rows of conduit. The installation was completed by electrical workers on the power company's construction and maintenance staff who added these supporting members to the basic structure as the work progressed. The resulting job was neat in appearance and engineering detailing time was greatly reduced. Should future requirements demand the addition of more conduit, the flexibility of these framing struts could easily be attached to other parts of the structure.



**CONDUIT SUPPORTS** in the Dan River Steam Plant of the Duke Power Company are formed from Unistrut sections, installed by power company employees and fastened to the basic structural steel as construction work progressed.

# SANGAMO *Type L* TIME SWITCHES



## Completely dependable—even at 50°F below!

Sangamo Type L Heavy-Duty Time Switches are built to give dependable operation under the most severe and widely varying installation requirements. Their operation is unaffected by extremes of temperature—they are lubricated for life with a special silicone grease that assures perfect operation in a temperature range from 50° F below zero to 200° F above, Fahrenheit. No special coils or other low temperature protective devices are needed—even in the coldest weather.

Other features that mean year after year of

trouble-free service are: the special Sangamo-developed *slow speed* motor that adds years of life to the switch . . . rugged, oversize silver to silver contacts . . . heavy machine-cut gears . . . and a large variety of special control features to meet every time switch need.

The Sangamo line is complete . . . see these high quality time switches at your electrical wholesaler and choose one for your next installation . . . the slightly higher price is soon forgotten—but the quality remains.

**SANGAMO ELECTRIC COMPANY**

SPRINGFIELD, ILLINOIS

Get the full story—write for Catalog No. 1010-A today.



ST-11-1



## FOR SAFETY

My Dear Watson!



## the NEW ALLEN ground detector

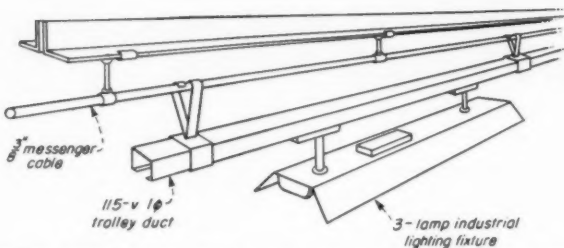
Quickly detects and locates grounds in all wiring systems and equipment. It is the answer to the urgent and ever-increasing need for safety, reduction of costs of production, operation and maintenance of Industrial Plants.

**NO SHUT-DOWNS NECESSARY  
IT ELIMINATES:**

INTERRUPTION OF PRODUCTION—  
SHUTTING DOWN OF POWER—  
DAMAGE TO PLANT EQUIPMENT

when used on isolated (ungrounded) power distribution systems.

Write for Technical Information and  
Descriptive Bulletin



**TROLLEY DUCT** is suspended beneath messenger cables in Ohio plant of Pesco Products. Lighting units and tools are served by this flexible power source.

## Trolley Duct Used For Flexible Lighting

—ILLUMINATION—

Fluorescent lighting, installed in the Bedford, Ohio, plant of the Pesco Products division of the Borg Warner Corporation, is designed for flexibility. Industrial 3-lamp lighting units are located above the various working areas but, so that they may be shifted easily or augmented by additional fixtures if higher levels of illumination are required, they are installed on a network of trolley ducts. Trolley ducts, in turn, are suspended from messenger cables supported either by structural framing members or the lower chords of roof trusses. Trolley duct is also installed to power hand tools, making it possible to minimize the length of leads while allowing workers to travel back and forth in an area along this linear source of power. Messenger cables are supported every 5 feet.

problem in the wiring of these moving parts. The wiring has to be safe, and it must be sufficiently rugged and sturdy to take the gaff of constant movement and vibration. It must also be out of the way of the operator and must not catch in projections or other parts of the machine.

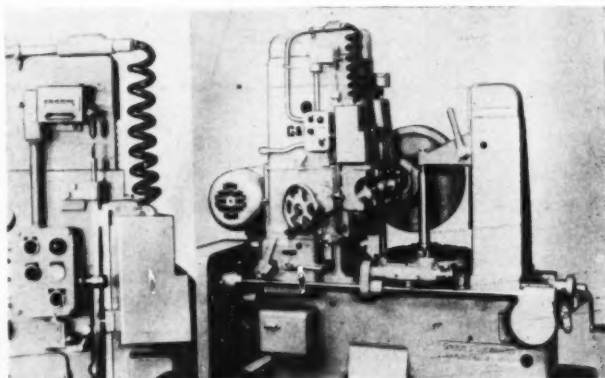
One of the most satisfactory methods of wiring a moving part has been applied to a special automatic cycle attachment on a Gould & Eberhardt 36S spur only automatic gear cutting machine. This automatic cycle attachment is wired by means of a Koiled Kord, a retractile cord that extends to approximately five times its retracted length and returns to its tight, out-of-the-way coil. In this case, it delivers power to a solenoid on a rapidly and frequently moving cutter slide, which causes a latch to move out of position at a predetermined part of the automatic cycle.

It is claimed that these cords stand up better on moving parts, since their construction enables them to absorb vibration. They are out of the way of the operator and do not catch in projections or other parts of the machine. They are neoprene jacketed, making them resistant to deteriorating effects of acids, grease or solvents which shorten the life of rubber-covered cords.

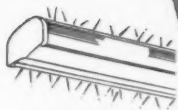
## Vibration-Proof Wiring

—INDUSTRIAL—

Manufacturers of machinery with moving parts which require electrical connections have long faced a tough

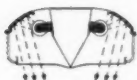


**ELECTRICAL ENERGY** is supplied to the automatic cycle attachment on this Gould & Eberhardt automatic gear cutting machine through a Koiled Kord, a retractile neoprene jacketed vibration-proof electrical cord.



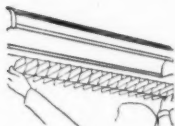
**PLASTIC  
"LUMI-SIDES"**

Extruded plastic side panels provide low surface brightness, create modern streamlined appearance.



**"DOWN-LITE"  
REFLECTOR**

Exclusive parabolic reflector increases downward component, boosts lighting efficiency.



**2-POSITION  
LOCK-LOUVER**

Louver drops on slotted hangers for quick relamping. Press slide to remove louver completely. To replace, just snap back into position.

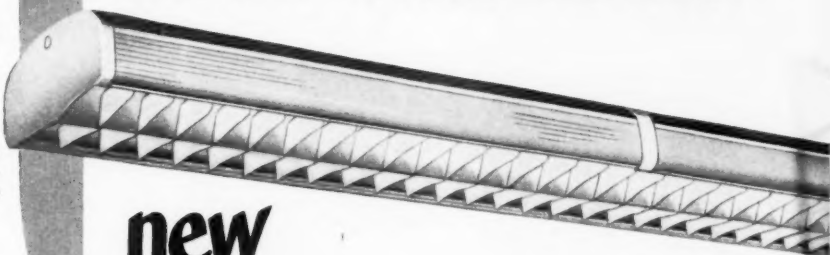


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Every MID-CENTURY Luminaire is a new achievement in better lighting, simplified installation and maintenance, modern good looks—and a *money maker* for you. Build your sales to schools, stores, offices, institutions with this complete profit-packed commercial lighting line.



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**MITCHELL Catalog No. 399**  
gives you full details on the many new selling features offered by the MID-CENTURY Line. Write for this complete brochure now.



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AMERICAN FEDERATION OF LABOR I.B.E.W. Label  
ELECTRICAL TESTING LABORATORIES, INC.  
CERTIFIED BALLASTS

These labels are your assurance that no step has been neglected in producing dependable fixtures that will please your customers and maintain a fine business reputation for you.

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# In the News

## Wilson Becomes Mobilization Chief

Charles E. Wilson, one of the leading business executives of the nation, and for the past eleven years president of the General Electric Company, was persuaded by President Harry S. Truman in mid-December to take on the responsibility of mobilizing the nation for defense. Thus, as Chief of the newly-organized Office of Defense Mobilization, Wilson will direct all phases of mobilization—prices, wages, production, plant expansion, transportation, and military procurement. Acting under the wide grant of authority given to him by the President, he becomes the second most powerful man in Washington, second only to Truman himself.

In taking on this assignment, Mr. Wilson resigned as president of the General Electric Company, and announced that he was severing all connections with corporate and banking institutions. He had completed 51 years of continuous service with General Electric in November, having started as a messenger boy with the Sprague Electric Company in 1899, which later became a part of General Electric. By 1939 he had risen to the presidency of the General Electric Company.

From 1942 until 1943 Mr. Wilson served as vice chairman of the War Production Board in Washington. He was then named executive vice chairman with full authority over all war production, serving in that post until 1944.

Ralph J. Cordiner, of New York, was elected President of the General Electric Company, to succeed Wilson. He assumed his new duties immediately.

Mr. Cordiner has been associated with General Electric for 24 years and has served as manager of five of the company's departments during that period. He has been Executive Vice President and a director of the company since 1949. In 1942 he entered government service as director general of war production scheduling and vice chairman of the War Production Board. He re-joined General Electric as assistant to the president in 1943 and was elected vice president in February 1945.

Mr. Cordiner was closely associated with the retiring president during the postwar years in the planning of the new organization structure that is to-



**NEW PRESIDENT** of General Electric Company is Ralph J. Cordiner (left), being congratulated here by Charles E. Wilson, who resigned this post to become Chief of the Office of Defense Mobilization.

day's General Electric. This planning resulted in a vastly expanded plant. It had as one of its goals the decentralization of General Electric's diversified lines into integrated departments. One result is that today General Electric's plants, scattered from coast to coast, number about 120 and the company's over-all business is at an annual rate approaching two billion dollars per year.

### Defense Mobilization

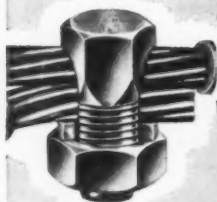
Charles E. Wilson's appointment as boss of the whole mobilization effort pointed up the nation's quick response to military setbacks in Korea, political setbacks in UN and elsewhere, and threats of further Communist aggression around the world. Mid-December was a turning point—the United States decided it had to prepare for war; first, as a measure to insure further world peace, and second, as a defense measure if further efforts at peace continue to be stalemated by Communists. Wilson was selected as the one man capable of providing inspired leadership, strong direction and powerful drive in Truman's mobilization program to cope with these world problems.

President Truman has passed on a wide grant of authority to Wilson to

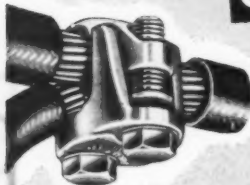
enable him to "direct, control and coordinate all mobilization activities of the executive branch of the government." These, and other powers spelled out in Truman's executive-order are so all-embracing that Wilson has already been described as "assistant president for the home front." These powers, and Wilson's record as a top war production official during World War II guarantees plenty of action now and in the months ahead.

Wilson's new Office of Defense Mobilization, in the rearranged organizational set-up of the existing Defense Production Act agencies, will of course top the list. Under ODM will come a production agency, a price-wage stabilization agency, and eventually, it is currently reported, a manpower agency. The production agency will contain all the controls now being administered by NPA under the Department of Commerce, by the Departments of Interior and Agriculture, and by the Interstate Commerce Commission. The price-wage stabilization agency will carry out the functions and policies already started by Valentine in the Economic Stabilization Authority. No legislation exists at present under which a manpower agency can be established. But it is generally recognized by Congress, the Adminis-

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tration and industry that the most critical shortage today, and it will continue to get more so as defense mobilization is stepped up, is manpower.

Defense agencies already in operation have felt the pinch of manpower shortage from the start. Getting these agencies staffed with capable businessmen will be one of Wilson's first big tasks. The problem extends all the way down to stenographers and clerks, however, which means that past employment policies will have to be re-examined and revised in the light of today's tighter manpower supply.

It will probably be February or March before controls and regulations imposed on industry will begin to reflect Wilson policies and direction. In the first place, military procurement policies will have to be more clearly outlined and put in effect. Defense orders will have to be placed in accordance with procurement policies, and defense plants will have to tool up. This all takes time. In the meantime, NPA has already acted on controls and regulations about as fast as the economy would permit and, in general, has done a pretty good job. There will be a gradual tightening of these controls, and an expansion to cover more materials and products, as conditions warrant, until the rate of defense production begins to pick up under the stepped-up defense program.

But the time is fast approaching now when defense production will hit the stride necessary to meet the new mobilization plans. And under Wilson's able guidance, industrial and economic controls will quickly fall in line to insure that the mobilization job is done, on schedule and with the least interference possible from normal civilian activities.



**KNOTTY PROBLEM** on inspection is solved by (L to R) M. F. Smalley, electrical engineer, The Ohio Power Co., Canton, Ohio; O. A. Glasow, chief electrical inspector, Northern States Power Co., Minneapolis; and S. Martin Streed, Minneapolis chief electrical inspector.





**Iowa Power & Light Company, Des Moines, Ia.**  
 Architect-Engineer: Elmer Borg, Brooks-Borg, Architects, Des Moines. Electrical Contractor: Johnson Electric Company, Des Moines. Area: Approximately 385 square feet. Wattage: 2208.

Watts per square foot: 5.7. Intensity—all lamps on: Average on desk, 101 Footcandles in Service; Average in entire room, 96 Footcandles in Service. Luminous Ceiling: Six panels, 48" sq.; 48—4" Slimline strip fixtures, 96—#9015 Holophane Lenses.

## *A Luminous Ceiling by Litecontrol*

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This smart, modern executive office—featuring Litecontrol's Luminous Ceiling with Holophane #9015 low brightness lenses—is unusual for its attractive appearance, for its good functional design. Its Litecontrol-planned wiring permits either of two levels of intensity at the flick of a switch.

This Luminous Ceiling increases the beauty of the room, sheds well-distributed light on the toughest executive problems. MORAL: when you

have problems . . . *hard-to-handle lighting problems* . . . you'll save time and trouble by contacting your nearest LITECONTROL Representative.



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### Milwaukee E.M.E. to Award Scholarship

The Electrical Maintenance Engineers Association of Milwaukee, Wis., recently announced the establishment of a \$1,500 Scholarship Fund to permit attainment of an electrical engineering education by worthy members, or their sons, or sons of deceased members of the association. The first award will be made early in February 1951.

According to the Eligibility Rules set up by the Scholarship Committee, an applicant, or his father, must have been a member of the Association prior to June 1, 1950 and must be financially unable to secure advanced education. The applicant must take, or may now be taking Electrical Engineering in one of the following Wisconsin schools: Marquette University, Milwaukee School of Engineering, or University of Wisconsin.

To be eligible, the applicant must be under 30 years of age and must have been graduated from high school between 1940 and 1951 (a 1951 graduate is eligible for the 1951 award).

The winner of the scholarship will receive up to \$500 per year (as decided by the Scholarship Committee); and must maintain a satisfactory scholastic and personal record to maintain the scholarship.

The award will be made by the Scholarship Committee consisting of the following: Fred J. Van Zeeland, Director of College of Electrical Engineering, Milwaukee School of Engineering; J. G. Van Vleet, Chairman, Department of Mechanical Engineer-

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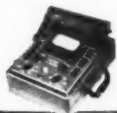
Equally valuable in electronic research, production testing or special circuit investigation, these versatile Weston instruments are available through your local Weston Representative. Consult him, or write for booklet on **WESTON Test Instruments**, Weston Electrical Instrument Corporation, 589 Frelinghuysen Avenue, Newark 5, New Jersey... *manufacturers of Weston and Tagliabue instruments.*



**Model 564 Volt-Ohmmeter** provides a broad selection of resistance and d-c voltage ranges. Self-contained battery for resistance measurements. Sensitivity 1,000 ohms per volt.



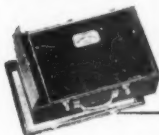
**Model 697 Volt-Ohm-Milliammeter** combines a-c and d-c voltage, direct current, and resistance ranges. Self-contained battery. Sensitivity 1,000 ohms per volt.



**Model 769 High Frequency Electronic Analyzer** makes most electronic measurements for FM, AM and TV service work in the vhf and uhf fields. Three instruments in one: volt-ohm-milliammeter, high impedance electronic volt-ohmmeter, probe type vacuum voltmeter.



**Model 779 Supersensitive Analyzer** checks tube circuits in electronic control equipment, transmitters, receivers. Measures current, potentials; indicates power levels in decibels in audio, public address and communications equipment. Sensitivity 20,000 or 1,000 ohms per volt... 26 practical ranges.



**Model 798 Proportional Conductance Tubechecker** for industrial, laboratory and general testing of receiving tubes, voltage regulator tubes, low power Thyratron tubes. Uses differential frequency system; provides mutual conductance ranges to 12,000 micromhos.

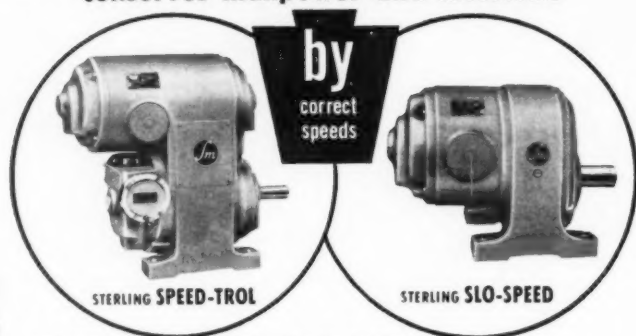


**Model 686 Mutual Conductance Electronic Tube Analyzer** tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes, both in accordance with manufacturers' rated operating conditions and at other values for non-standard applications.

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**Easy!** to install. Effective and compact. For either lead sheath or braid cable.



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No lead joints to wipe.

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ing, University of Wisconsin Extension Division; J. E. Matar, Assistant to the Dean, College of Engineering, Marquette University; Walter Hennig, Edward Tellier and William Lampiris (Chairman) of the Electrical Maintenance Engineers Association. Only in the case of a tie vote in the Committee, does the president of EME vote on the award.

The Scholarship Committee's decision on an award must be approved by the Board of Directors of the Electrical Maintenance Engineers before it becomes final.

### REA Launches Educational Program

Inspection of electrical wiring installations in rural areas always has been a problem. Lack of efficient, trained manpower is one reason. The practice of spot-checking only a few installations in a specific area is another. Inherent objections of rural populations to state licensing and inspection laws is another contributing factor.

With electrical energy consumption increasing on the farm, REA borrowers realize the need for improved inspection programs and have asked REA headquarter for assistance. The answer to their plea is the development of an improved power use and cooperative education program.

As outlined by Thomas P. Branch, REA Power Utilization Specialist in



**EXHIBITS** at the 2nd Annual Tri-State Industrial Electric Exposition in Pittsburgh, October 1950, attracted attention of L. W. Hornfeck, (left), and Evan E. While (right), of the office of James Paul Warner, Pittsburgh consulting engineer. M. F. Root, Pittsburgh district manager for Harvey Hubbell, Inc., demonstrates a new product.



**PITTSBURGH's** billion dollar building construction program, greatest in America today, is the subject for discussion between Harold Siler, Pittsburgh Reflector Co., (left) and Wm. N. McDermott, Howard P. Foley Co., electrical contractor, both of Pittsburgh, Pa.

Washington, D. C., this new program is designed to:

1. Acquaint consumer members with all facts regarding the organization, construction, operation and maintenance of their system.
2. Help members plan wiring installations and select equipment best suited to their needs.
3. Aid members in getting their equipment properly installed.
4. Keep dealers informed regarding the cooperative's program and their responsibility in it.
5. Secure the wholehearted cooperation of the skilled wiremen.
6. Assist in planning and conducting a wiring training program when skilled wiremen are not available.
7. Plan and conduct inspector training schools in areas where needed.
8. Cooperate with the co-op's electrical wiring inspector, exchange ideas and information with him.
9. Secure cooperation of others particularly educational groups.

Results of the program, to date, have been encouraging. Statewide meetings of REA inspectors and co-op officials have, in many cases, resulted in uniform inspection methods and requirements. A clearer understanding of wiring methods and the reason behind inspection have led many members to request inspection service.

A need exists for a concerted re-inspection and rewiring program for practically all rural wiring connected to lines prior to 1945. REA hopes its new power use and member education program will make it easier for electric co-ops to secure member acceptance of such a re-inspection program.

**CIRCUIT BREAKING PLUGS  
RECEPTACLES - - -  
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**RATINGS  
FROM —  
30 TO 400 250 AND  
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**Heavy Duty Industrial  
Water-Tight and  
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## ENGINEERED AND PRECISION BUILT—

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### SAFE OPERATION

Positive grounding by means of housing and separate contact for safety circuit wire.

Polarized by means of contact arrangement and groove and key in housing. Impossible to insert plug incorrectly.

All contact surfaces are precision machined and adjusted for maximum contact pressure, reducing arcing to a minimum.

Arcing chamber is completely inclosed. Arc is extinguished before plug is completely removed.

FOR

### LOW MAINTENANCE

Contacts—free floating, self-wiping, stay clean and retain full contact pressure.

Sealed cable grip—no strain on connections. Excludes all dust and moisture.

Ground surfaces and durable oil-resistant gaskets.

Liberal space for wiring, quick and easy access. Facilitates inspection and servicing.

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### EASE OF INSTALLATION

Substantial external lugs for easy mounting.

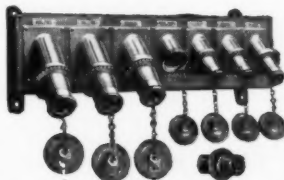
Boxes will accommodate a variety of conduit outlets to suit all job requirements.

Ample wiring space and substantial terminals make wiring easy. Assembly of interior and contacts requires no special tools.

Interiors do not extend back of covers permits direct assembly to cabinets without internal interference.

A high degree of standardization and interchangeability of parts provides a wide variety of types and sizes to suit every requirement.

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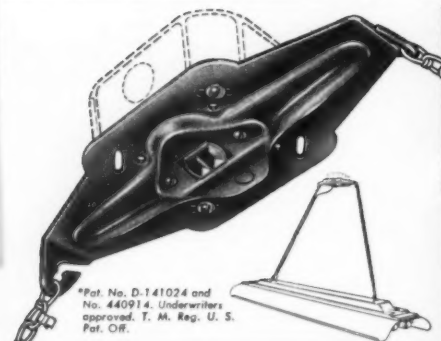
**NEW COMMUTATOR GRINDER** in Ideal Industries, Inc. booth at the Pittsburgh Industrial Electric Exposition attracts attention of Ross Ferguson, (left), electrical foreman, and L. G. Atkinson, supt. of maintenance, both of Westinghouse Electric Corp.'s Beaver, Pa. plant. R. F. Waldo (right), Ideal's division sales manager, Pittsburgh office, explains the major features of this grinder.

## IES Northeastern Region Convenes

The Illuminating Engineering Society's Northeastern Regional Conference, held in New York City's Hotel Statler, recently presented a comprehensive, interesting and informative program to representatives of 11 states, Canada and Great Britain. Addressed by local, regional and national officers, and by representatives of research, educational, utility and manufacturing organizations, the delegates were served a balanced menu of food for thought, including a Parade of Progress and discussions on lighting and color, contemporary residential lighting, luminous ceilings combined with radiant heating, mercury lighting color correction, glare analysis, educational programs and interesting installations located in the New York, Connecticut and New England Sections.

Following the welcome by Carroll O'Shea, chairman of the host Section, the national IES program was discussed by president Walter Sturrock. On the theme, "Lighting is Serious Business," he stated that, "men of all ages have worshipped light, symbolically including it in many sacred and fraternal ceremonies." Stressing its present importance, president Sturrock cited numerous fields of research promoted by the Society and reviewed the contributions of the organization's many standing, general and task committees.

Regional vice-president Richard



\*Pat. No. D. 141024 and  
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2. Screw hanger to outlet box—only two screws needed. No centering, punching, or drilling. Screwdriver only tool needed.



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Hydee Hanger: complete with receptacle, two 3-ft. chains, "S" hooks and clips—

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Slauer reviewed northeastern activities and briefly discussed tentative plans for the "NYC in '53" national convention. Then, illustrating the growth of the IES with a tangible demonstration, he presented a charter for a new student-branch chapter to the City College of New York.

Paying tribute to the many illuminating contributions made to the industry by past president Ward Harrison, L. J. Davies, present president of the British Society, presented Mr. Harrison with a certificate of honorary membership in that organization. The significance of this award was more fully appreciated when Mr. Davies explained that his Society's by-laws limit honorary memberships to six, that only four are now in existence, and that Mr. Harrison is the only non-British recipient of this recognition.

James Forbes, Conference Chairman, briefly sketched the highlights planned for the 2-day conclave, then relinquished the platform to Alston Rodgers, Ch., and T. C. Sargent, vice ch. of the IES Committee on Progress, who jointly presented an intensively interesting review of 1949-50 developments in light sources, accessories, lighting applications, glass and plastics, fixtures, practices and education. Combining a variety of stage settings, numerous displays of equipment, slides, charts, dramatics and humor, this Parade of Progress proved Mr. Rodgers' opening statement that, "This has been a good year, with newer light sources and well-designed equipment now readily available. Improved installations everywhere evidence the growing appetite for comforts and advantages brought by better things in light. This is attested by the recent Census of the

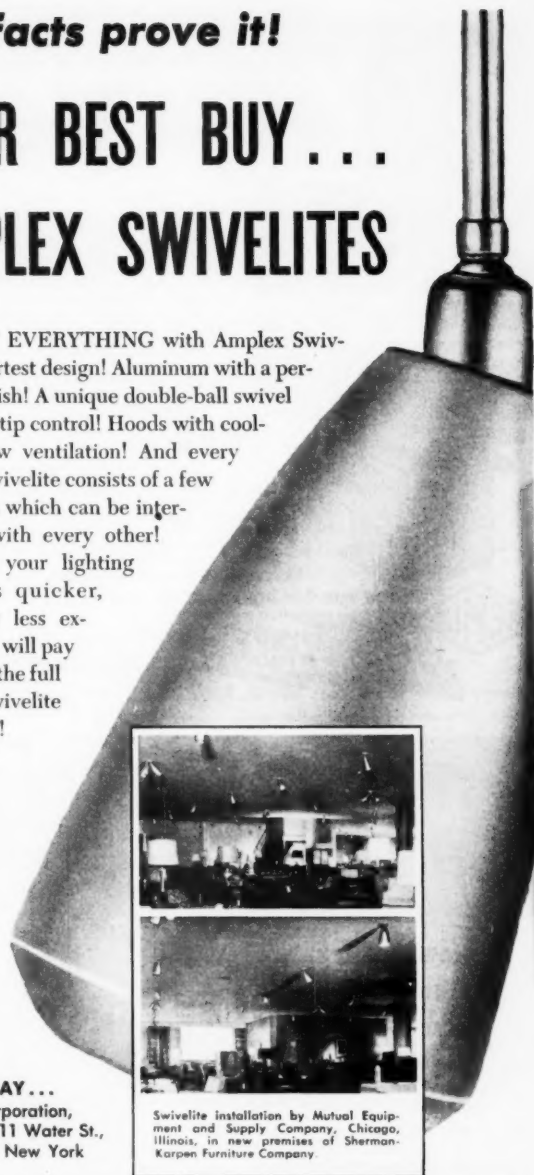


**INDUSTRIAL WIRING SPECIALIST**  
at the Wagner-Smith Electric Company, Dayton, Ohio, is Lowell Counciller. He has been with the contracting and engineering firm for the past 12 years as engineer and estimator.

**The facts prove it!**

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**EQUIPPED WITH SYNCHRONOUS, SELF-STARTING MOTORS**

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Highest quality material and unexcelled craftsmanship combine to make Automatic Time Switches the preference of those who demand long life dependability backed by an unconditional guarantee.

Compact, carefully engineered Automatic Time Switches have new type, easily set trip levers. Trip levers and dial are visible thru window in attractively finished, tamper-proof case.

Stock Models: Single Circuit, Single Pole, 10 Amperes Capacity to Two Circuit, Four Pole, 45 Amperes Per Pole Capacity. Special models engineered to your requirements.

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**GUARANTEED — FOR ONE YEAR!**

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Department of Commerce late in 1949, indicating that annual total fixture sales exceed the \$479-million mark, and an estimated 250-billion-kwhrs of electricity are now used for lighting purposes."

R. M. Henderson, Ch. Connecticut Section, presided at the Thursday afternoon session. He introduced George Taylor, discussion leader for the Lighting and Color panel; Myrtle Fahs Bender, speaking on Contemporary Lighting for Modern and Traditional Interiors, and Lillian Eddy, who gave an entertaining analysis of Fluorescent Lighting in the Home. Mr. Taylor, in turn, introduced his discussion panel speakers: Richard Belcher, staff architect for R. H. Macy; Robert Myers, representing the Mohawk Carpet Mills, and Lawrence Harrison, consulting engineer for the Metropolitan Museum of Art.

Speaking as consumers, only interested in lighting as it affects the buying mood or the psychological reaction of a customer, the panel brought forth many important points connected with lighting for selling, display, attraction, emphasis, depth, warmth and true color, rendition of fabric, paint and other materials.

Miss Fahs Bender's discussion centered around the recently-completed report compiled by the Residence Lighting committee studying "the application of light and lighting in the home, including the aesthetic phase, including good lighting practices in period and modern interiors." The report, non-technical in nature, included numerous illustrations of methods recommended for lighting designers, architects, interior designers, contractors, builders and homemakers. Included were examples of cove, recessed, window and wall lighting, the use of fluorescent tubes, portable lamps and decorative effects.

Ralph P. Wagner, Ch., Better Light — Better Sight Bureau, made the keynote address on Planned Lighting at the Friday morning session, being introduced by John Young, Ch., New England Section of IES.

The Planned Lighting theme was continued by the following panel of electric company engineers: T. M. Barr, Central Hudson Gas and Electric; A. R. Hampsey, Jr., Duquesne Light; C. D. Hollister, Niagara Mohawk Power; W. J. Schmidt, Long Island Lighting, and T. A. Tellefsen, Rockland Light and Power. These five speakers cited numerous examples of effective promotion campaigns, discussing methods used to educate school children, PTA groups, housewives, plant owners and business groups as to the importance of good lighting. Clinics, meetings of key persons in a



**ELECTRICAL ENGINEER** E. G. Merkle (center), Bemis Brothers Bag Co., St. Louis, and president of the Industrial Section, St. Louis Electrical Board of Trade, confers with speakers K. H. Boehmer (left) and A. W. Brun, sales engineers of The Louis Allis Company at recent meeting of the Section.

community or organization, motion pictures, window displays, advertising and mailed literature were listed as some of the promotional tools. That these methods were effective was proven by the results obtained; one outstanding illustration being the school relighting program promoted by the Niagara Mohawk Power Corporation in the Albany-Troy-Schenectady Capitol District, where a total 326 re-lighted classrooms in 42 separate schools were directly resultant.

The subject, Luminous Ceilings Combined with Radiant Heating, was discussed absorbingly by Professor Domina Spencer and L. F. Martin. After Miss Spencer discussed the theory of light and heat radiation, and presented facts supporting the efficiency of an overhead lighting-heating installation, Mr. Martin displayed such an installation on the platform. Thermostatic control, installation features of lamps and the corrugated plastic ceiling, the action of sprinkler systems when installed with such a ceiling, and utilization coefficients were some of the problems included in the presentation. Unusually keen interest was exhibited by delegates in the details of this platform mock-up.

The final technical session, presided over by Marshall Waterman, Ch. Conference Papers Committee, included discussions on color correction and other improvements associated with mercury lighting, an analysis of glare appraisal systems, and outstanding lighting installations in the north-eastern region.

J. R. Jones and W. S. Till discussed the subject of mercury lighting, while C. L. Crouch analyzed glare appraisal systems.

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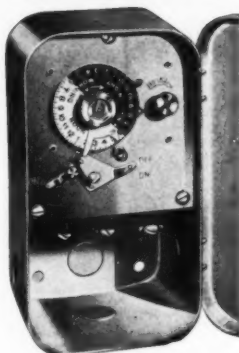
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As at other conferences, the session discussing "Most Interesting Lighting Jobs" was jam-packed with interest and information on layout and design, problems and solutions, equipment adaptation and installation methods. The six projects discussed combined variety of both territory and techniques, for the presentations included a church and a bank in Connecticut (discussed by Frank E. Brown and Fred Hill), a museum and department store in Massachusetts (analyzed by Williard W. Thompson and George L. Ely), a New York hospital room (by Bernard F. Greene) and an office building in New Jersey (Walter Greenwood). This group of discussions, judged on the merits of treatment and presentation, resulted in the naming of co-winners; Fred Hill and Williard Thompson.

An award of merit was also presented to the Connecticut Light and Power Corporation for the most effective display prepared by a sustaining member.

## NISA to Award 50-Year Certificates

By recent action of its Board of Directors, the National Industrial Service Association, Inc., will award annually certificates of recognition to individuals connected with the electrical industry for 50 years or more.

As interpreted in the Board resolution, Electrical Industry is not confined to electrical service alone, but includes any branch such as manufacturing, wholesaling, contracting or utility. The recipient of such a certificate, however, must be an executive or associate representative of his company in NISA and must have served in this capacity for at least two years prior to date of presentation of the certificate.



**ELECTRICAL ADEQUACY** in the home pays dividends to the owner and the contractor, agree (L to R) Charles Beadnall, Fred Schleicher and Nicholas Schultz—all electrical contractors in St. Joseph, Missouri.





**FAY EADS**, owner of Hammond Electric Company, Hammond, Indiana, is a student of modern shop methods. In the motor repair business for more than 30 years, he has a majority of the large industrialists in the area as his customers.

## AW Conference To Be Held in Cincinnati

Several novel presentations will be given at the Seventh Annual Adequate Wiring Conference at the Sheraton-Gibson Hotel in Cincinnati, February 15 and 16. The presentations will dramatize the operations of two successful adequate wiring programs—one in Cincinnati, the other in Dayton. Study of the two programs will be a main feature of the meeting which will attract an all-industry gathering of electrical contractors, utility and league personnel, wholesaler and manufacturer representatives.

As formerly, this year's conference will be of interest to industry members who are concerned with the promotion of adequate home wiring. Delegates will discuss the major AW problems facing the industry today.

The first day's session will feature a word of welcome by a prominent industry personality. The keynote address will be given by N. J. MacDonald, vice president of The Thomas & Betts Co. and chairman of the National Adequate Wiring Bureau's Executive Committee.

The remainder of the morning will be devoted to an analysis of the Cincinnati AW certification program—how it is set-up, who does the selling and what are the benefits to the various industry groups and to the customer. Participants will include A. J. Rutterer, supervisor of Cincinnati Gas and Electric's lighting division; Robert Neel, field representative for the utility who works with speculative home builders and constructors of multi-family dwellings; and an occupant of an adequately

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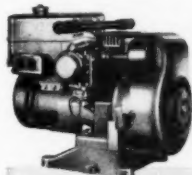
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wired home. One or more members of the home lighting department of the utility will illustrate how sales are made to customers who are planning to build and to those who live in homes with insufficient wiring.

In the afternoon there will be a study of the Dayton Adequate Wiring program. An executive of Dayton Power and Light will explain why his company gives the local Bureau its all-out support. Herbert Snead, executive secretary of the Dayton Adequate Wiring Bureau, will preside.

Participants will include C. B. Kuntz, chairman of the Bureau and chief electrical inspector for the city of Dayton who will emphasize the industry-wide harmony that has resulted from the adequate wiring program. Fred R. Jones, field representative for the Bureau, will explain how adequate wiring is sold in farm and non-urban areas. J. K. Simpson, field representative, will explain the sales approach in metropolitan Dayton and describe his work with group audiences. David Black, electrical contractor-dealer in Verona, Ohio, will discuss how the program benefits his wiring and appliance business. In addition, the session will include presentations by a wholesaler member of the Dayton AW Bureau and a local speculative builder.

R. W. Wilson, manager of commercial service for Kentucky Utilities Co., will follow the Dayton study with a group presentation on adequate wiring.

The second day's program will feature a discussion of certification standards. Conferees will have an opportunity to give their views on the various requirements and to make recommendations for improvements in the national standards.



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## Recommended Practice of Daylighting

The Illuminating Engineering Society has published another report covering one of its series of lighting study projects. This 36-page report is devoted to the problem of utilization of daylight in building design, and is titled, "Recommended Practice of Daylighting".

An introductory section describes design principles for windows, shows illumination distribution in rooms, and includes tables of solar position in various latitudes. The report also recommends window arrangement, control media such as louvers, blinds and glass blocks, and treatment of reflecting surfaces of work areas in schools, factories, offices and homes. It further defines terms used and sets up criteria for good daylighting. Many photographs and charts are used.

While "Recommended Practice of Daylighting" will be particularly valuable to architects and building designers, it will also be of interest to all illuminating engineers, electrical consulting engineers and electrical contractors who design and specify interior artificial lighting systems, as it is highly important that artificial lighting systems and daylighting designs work together and supplement each other. Copies of this report are available from the Publications Office, Illuminating Engineering Society, 51 Madison Avenue, New York 10, N. Y. Price is 50 cents per single copy.

## Arc Welding

Procedure and practice of arc welding, useful to both students and practicing welding engineers, operators and designers, are discussed at length



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in the "Electric Arc Welding" book prepared by the Hobart Trade School of Troy, Ohio. Following a section on general welding information are sections on operator training courses, carbon arc welding and cutting, other welding processes, welding terms and definitions.

In the introductory section, the development of arc welding is described with applications, available metals and alloys, joints and welds, electrodes, equipment and other basic procedures. The second part constitutes a complete self study course. This is followed by a description of principles and practice of carbon arc welding inert-gas-shielded arc welding, submerged arc welding, electric stud welding and definitions of terms approved by the American Welding Society.

Over 600 photographs of operations, charts and diagrams are included in the 544-page book. Available from the Hobart Trade School, Inc., Box EW-146, Troy, Ohio, the book is priced at \$3.00.

## Dates Ahead

Plant Maintenance Show and Conference—Cleveland, Ohio, January 15-18.

International Heating and Ventilating Exposition—Commercial Museum, Philadelphia, Pa., January 22-26.

American Institute of Electrical Engineers—Winter General Meeting, New York, N. Y., Jan. 22-26, 1951.

National Electric Sign Association—Hotel New Yorker, New York, N. Y., February 5-7.

The Power and Communication Contractors Association (formerly RECA)—Annual Convention, Edgewater Beach Hotel, Chicago, Ill., Feb. 4-6.

National Adequate Wiring Bureau—7th annual conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, February 15-16.

National Electrical Manufacturers Association—Edgewater Beach Hotel, Chicago, Ill., March 12-15.

North Central Electrical Industries—All-Industry Convention, Hotel Nicolet, Minneapolis, Minn., Feb. 25-28.

Electrical Maintenance Engineers Association of Southern California—Fifth Annual Industrial Electrical Show, Shrine Convention Hall, Los Angeles, California, March 15-17.

Edison Electric Institute—17th Annual sales conference, Edgewater Beach Hotel, Chicago, Ill., April 2-5.

Chicago Electrical Industry Trade Show—Sponsored by Electric Association of Chicago, Sherman Hotel, Chicago, Ill., April 2-5.

Midwest Power Conference—Hotel Sherman, Chicago, Ill., April 4-6.

National Industrial Service Association—Annual convention, San Antonio, Texas, April 15-18.

National Materials Handling Exposition—International Amphitheatre, Chicago, Ill., April 30 to May 4.

Chamber of Commerce—39th Annual meeting, Washington, D. C., April 30-May 2.

National Fire Protection Association—Annual Meeting, Detroit, Mich., May 7-11.

National Association of Electrical Distributors—Atlantic City, N. J., Week of May 20th.

Edison Electric Institute—Denver, Colo., June 4-7.

Illuminating Engineering Society—National Technical Conference, Hotel Shoreham, Washington, D. C., August 26-September 1.

National Electrical Contractors Association—Annual convention, Shoreham Hotel, Washington, D. C., October 9 to 12.

National Electrical Manufacturers Association—Chalfonte-Haddon Hall, Atlantic City, N. J., November 12-15.

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## INDUSTRIAL ELECTRONIC CONTROL

2. New 2nd Edition. Contains latest information on electronic construction and their practical applications in industry. Designed to give you a basic working knowledge of electronic control for selling, installing, and servicing electronic equipment, this book covers electronic tubes, circuit components, basic electronic circuits, industrial electronic circuits, etc. Included are tables, charts, formulas, etc. By W. D. Cockrell, Gen. Elect. Co., 270 illus., 247 pages, \$4.50.



## NATIONAL ELECTRICAL CODE HANDBOOK



3. Gives rules and requirements of all jobs what they mean—how to apply them in accordance with the latest National Electrical Code. All rules for a job are grouped in one place. Covers definitions of Code terms and requirements applying to all wiring systems. By A. L. Abbott. 6th Edit., 633 pages, 481 illus., \$5.00.

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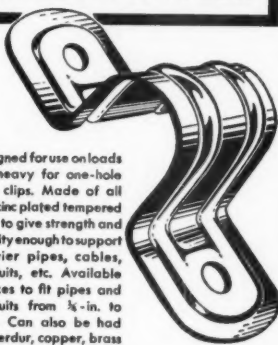
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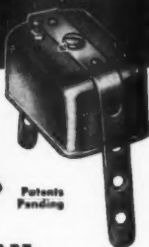
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## OUTLOOK FOR '51

[FROM PAGE 37]

cation of the basic materials—steel, copper and aluminum.

NPA now has the authority to clamp on any controls or regulations it finds necessary to promote the national defense. Controls to date have been relatively mild. NPA officials have recognized, however, that their controls and regulations must be geared with the step-up in production of military equipment, to prevent undue cut-backs in production of civilian products, goods, and services before defense procurement orders are placed. Defense spending is now being stepped up rapidly. Industry is fast gearing up for defense production. By mid-1951 defense production will begin to hit its "phase two" pace—assuming "phase two" to be an intermediate rearmament program short of an all-out war. Controls and regulations may be expected to get tougher and broader, to pave the way for this stepped-up program. The pinch will be felt more and more, from now on, probably hitting its peak during the third quarter—that is, again, short of an all-out war.

How far will NPA go with controls? How does NPA determine the practicability of the various controls it established?

Under the Defense Production Act, NPA is authorized to take any action related to priorities and allocations "found necessary and appropriate to promote the national defense". Their number one objective is to see that military (and essential civilian) production programs are met, on schedule. They will go as far as necessary, short

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#### ORDER M-14—Nickel—Dec. 1, 1950

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#### ORDER M-15 — Zinc (Subpart B — Use of Zinc)—Dec. 1, 1950

Provides for the necessary quantities of zinc for "D0" rated orders, and for equitable distribution of the remaining supplies for non-defense use.

#### ORDER M-16—Copper and Copper-Base Alloy—Dec. 18, 1950 (Subpart C —Distribution of copper and copper base alloy scrap)

Places a ban on toll agreements in copper scrap.



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of severe disruption of the civilian economy, to meet that objective.

NPA is staffed, however, by practical men, mostly with industry training and experience. In addition, Industry Advisory Committees made up of key industry men, are in general already appointed for most industries, and are consulted on each proposed order or regulation before it is issued. Controls and regulations may therefore generally be expected to be practical and workable.

Here are some things to watch out for in the months ahead:

Construction controls (NPA Order M-4) may be expanded to cover all construction. If this ban is made, a procedure for making application for authorization to build would be provided, whereby the essentiality of such construction would have to be given. Exemptions from such a ban would probably include military, AEC, NACA and U. S. Coast Guard construction, and possibly defense plants expansion and new construction for increased defense production capacity.

End use orders prohibiting aluminum and copper in a long list of civilian products is now under consideration, and will probably be issued by early January, 1951. Included will probably be residential, commercial and industrial lighting equipment, except copper for current-carrying parts.

As the demand for conservation of critical materials increases, more and more products, even those used for essential civilian and military use, will come under scrutiny for substitutions of the critical materials. Lighting fixtures is an example. Substitute reflectors will probably be considered for steel reflectors in fluorescent lighting fixtures, and an effort made to reduce the steel content in the remainder of the unit. The amount of steel used in residential fixtures will probably be limited.

Maintenance, repair and operating supplies (MRO) is recognized as a necessary item in both defense plants and for civilian structures. The present construction controls order (NPA Order M-4) placing a ban on construction for amusement, recreational or entertainment purposes, now exempts construction on these same type buildings or structures for "Maintenance and repair on any building or structure". It is expected that a similar exemption will be included in other end-use orders. And if the materials situation becomes sufficiently critical, NPA will probably provide some type of priorities assistance for obtaining materials to be used solely for MRO.

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[FROM PAGE 43]

local codes, ordinances and safety orders, (2) knowledge of electrical materials and apparatus as to intended purpose and proper operation, (3) purchasing power, secured through volume orders backed by financial security, (4) reasonable charges and guaranteed performance, resulting in valuable repetitive contracts, (5) diversified abilities, gained through past experience and constant study of new methods and products, (6) modern tools in good condition and testing apparatus for accurate analysis, (7) ample transportation facilities, (8) a comprehensive stock of replacement parts for fast service, (9) 24-hour service, 7 days a week for emergency work, (10) competent personnel in the shop, on construction and in the office and (11) sound electrical engineering advice and counsel.

In line with the policy of supplying a complete engineering service rather than bidding only on prepared plans and specified work, Pacific Electric also promotes comprehensive testing and maintenance programs. Salesmanship plays an important part in both categories, with customers generally receptive to suggestions leading to increased economy, efficiency, safety or dependability. These factors are stressed constantly. To illustrate: customers are reminded that power costs can be affected by the method used to supply service, by the location of distribution centers, by metering methods, by power factor and maximum demand. Surveys to check these conditions are recommended, and resulting analysis frequently paves the way to mutually-beneficial electrical modernization. Warning signs of an overloaded system, such as warm lugs, cables or switches, are also mentioned, and verified by checking the adequacy of the circuits. Testing the resistance of insulation is also recommended on the grounds that deterioration can result from the presence of excessive temperatures, dampness, corrosive acids or gasses. Relocation of circuits and large-scale rewiring jobs have resulted from this survey-sale approach.

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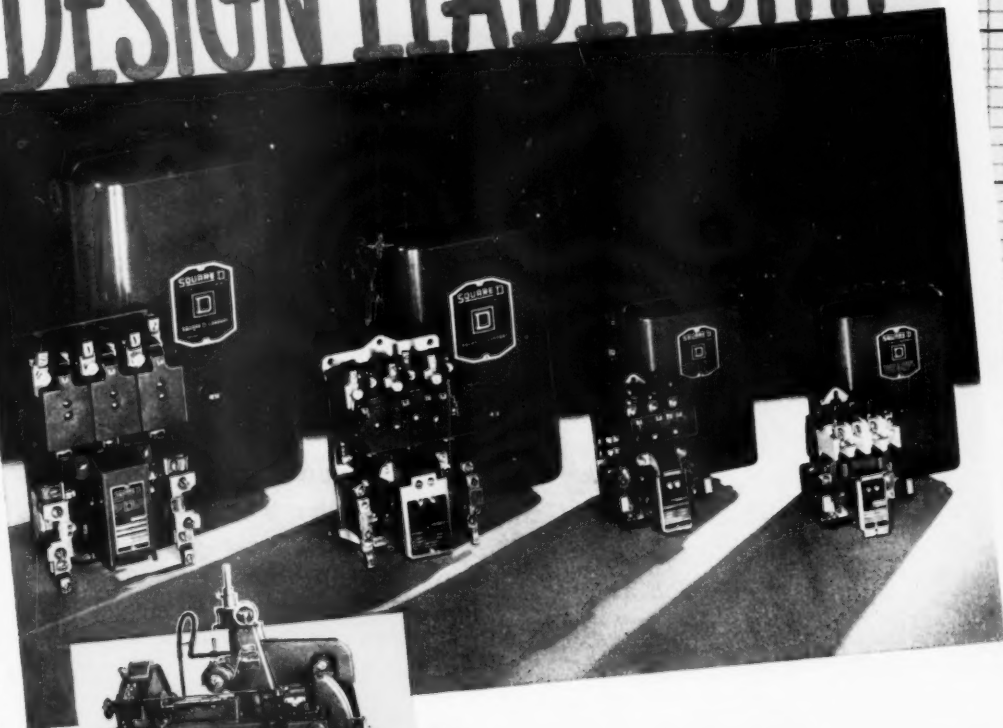
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## SQUARE D MOTOR STARTERS

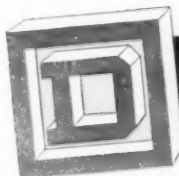
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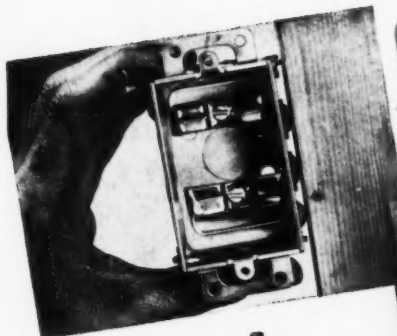
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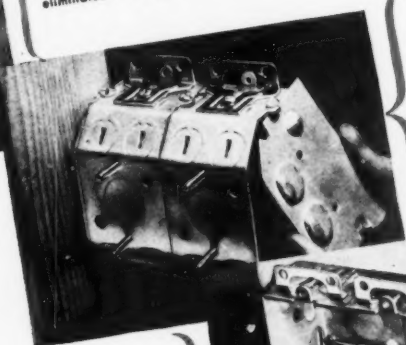
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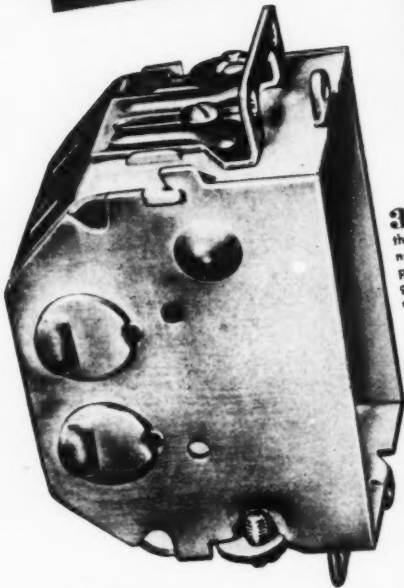
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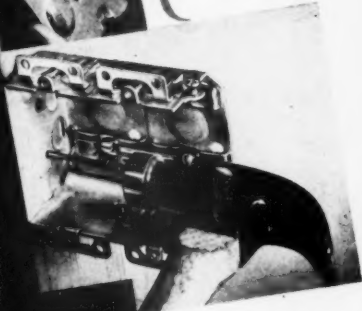
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